Municipal Engineering

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The Seventeenth Convention of the American Society of Municipal Improvement

FOLLOWING its usual custom MUNICIPAL ENGINEERING devotes a large space this month to the proceedings of the Erie convention of the American Society of Municipal Improvements. This is done the more willingly because the number of practical papers offering definite information which helps in the solution of municipal problems is even greater than usual. In the light of the fact that this society has always been a society of good work, this is high commendation of this particular convention.

President Kendrick called the convention to order promptly according to program for a brief and hearty welcome from Mayor Liebel, who gave some interesting and valuable data regarding the history, the present condition and the prospects of the city and paid a well deserved tribute to the city engineer, B. E. Briggs. The president's address was devoted largely to the Pacific Northwest in which he has recently spent much time, and he made a suggestion that local branches be established in districts so inaccessible to the regular meetings of the society. The secretary and treasurer reported satisfactory financial conditions and over 30 new members admitted during the year, making the total more than 300. The afternoon session in common with the later sessions followed the program printed in the October number of MUNICIPAL ENGINEERING, with the addition of a paper by City Engineer C. H. Rust on sewage disposal for Toronto. Mr. O'Neil's paper on the construction of exposed sewers at Leavenworth, Kan., is presented this month. Others will follow later.

The discussion of Mr. Rust's paper brought out the growing dissatisfaction with the sufficiency of the septic tank, and the necessity of designing a system for the local conditions. It also emphasized the position taken some years since by MUNICIPAL ENGINEERING, in common with many experienced engineers, that the degree of purification to be demanded from the sewage disposal plant is dependent upon the rapidity of the purification possible in the body of water into which the sewage is discharged. This depends upon the quantity of water, the oxygen contained, the conditions of flow, and the like, and true economy as well as sanitary safety demand that the degree of purity attained by the disposal plant shall suit the local conditions, concerning which no hard and fast rule can be laid down. This is a point which State Boards of Health have been disposed to miss, especially when their technical advisers have been men with insufficient experience to be able to judge each case upon its merits and so have fallen back upon rules made undoubtedly safe from the sanitary point of view, without reference to the economics of the problem. The committee on sewerage and sanitation promised for next year a tabular summary of the principal sewage disposal plants in the country.

The evening session was filled with papers and lectures illustrated by the stereopticon, the most notable being by Rudolph Hering, showing European sewage disposal works, more particularly those which are reducing the sludge problem to manageable proportions, partly by reducing the amount and partly by rendering it entirely innocuous. The lecture was not written and a report would require the photographs, which could not be procured in time for this report.

City Engineer Clark G. Anderson, of Moline, Ill., presented a paper on the co-relation of sidewalk grades to curb grades, which is reproduced herewith, and reduces some of the problems in this line to definite form and offers some excellent solutions for them. A talk on laying asphalt with a surface heater, for which moving pictures had been promised, turned out

to be an advertising speech with a few lantern slides, during the progress of which the speaker was called to order. This occurrence, together with one or two later of similar nature led to a discussion of the subject of associate membership and the relations of associates to the programs of the society, which should result in a closer drawing of lines in the programs and in the discussions of papers.

FRED GIDDINGS, PRESIDENT,
Atchison, Kan.

Another illustrated paper by J. E. Putnam, assistant city engineer, went to show some examples of street lighting in Rochester, N. Y.

The morning session of the second day was quite full and carried two papers in addition to those on the regular program; one on the economics of modern highway engineering by Prof. Arthur H. Blanchard, of Brown University, Providence, R. I., and one on asphalt repair by City Engineer Henry C. Allen, of Syracuse, N. Y.

The paper by Mr. Kingsley, of Little Rock, on "Bituminous Pavements, Patented and Otherwise" created considerable stir being largely a protest against the court decisions upon the validity of the bitulithic patents. Mr. George C. Warren, president of Warren Brothers Company, made a comprehensive impromptu reply to the protest which, after all, can be of little practical avail unless it is made to the courts having the cases under consideration. The paper and Mr. Warren's reply are given herewith as fully as the limitations of space permit, that both sides may be considered together. The general conclusion seems to be that there are certain pavements in use which are somewhat similar to the bitulithic pavements, though lacking in strict adherence to the principles upon which the bitulithic patents rest, and that such pavements are not subject to royalties for patents, and that Mr. Warren does not object to the use of these pavements, but objects only to their misclassification as bitulithic pavements. This stand appeared to be justified by the samples shown, which, with but one or two exceptions, showed a bituminous macadam base with a bituminous mortar wearing surface. The exceptions noted did not show the bituminous mortar surface and one of them was apparently a complete mixture of the bituminous concrete base and mortar top in a single homogeneous layer. Whether this single layer could be classed as bitulithic would apparently depend upon whether the sample would show by analysis the selection of sizes to produce the minimum of voids and other characteristics which the bitulithic patent prescribes. The writer had several discussions on the subject with Mr. Fred J. Warren, the inventor of the pavement, and is disposed to think that Mr. Warren did conceive the idea of the bitulithic pavement on account of his experience with Denver pavements, to some of which Mr. Kingsley refers in his paper, but that the bitulithic pavement as formulated by him differs materially from the Denver pavements in that the latter only by chance and therefore very seldom approach the essential condition of the former, namely, a selection of certain sizes of stone which reduces the voids in the mass to a practical minimum. It is of course more expensive for cities to use forms of pavement while subject to royalty for patents than after the patents have expired, but this is the result of the desire to encourage inventive genius by giving it an opportunity to secure financial returns for its activity and is not to condemn that genius nor to subject it to condemnation on account of the workings of the patent law. The practical value of the paper lies in the attention which it calls to substitutes

for bitulithic which are not included under the specifications of the patents. These pavements may be studied and adopted if found satisfactory.

Some of the work set for the second morning was carried over to the third morning and to it were added two papers on supervision of municipal work by W. P. Blair, of Indianapolis, and on the pavements of Erie by Assistant City Engineer F. G. Lynch.

The sub-committees of the general committee on standard specifications seemed to be sadly confused by misunderstandings and mis-information, but four reports were finally presented as progress reports, prepared mainly by the chairman of the committees, and were placed on file for further consideration by the general committee. The status of the general committee was finally stated and it was made a standing committee of the society with power to appoint sub-committees upon special subjects, its field to cover all kinds of specifications in use in municipal work. Mr. Linn White of Chicago, presented a verbal report on bituminous paving nomenclature, stating that the American Society for Testing Materials is at work upon the question and a report would best be made after joint consideration. Mr. A. W. Dow for the committee on wooden blocks and Mr. F. P. Smith for the committee on asphalt paving specifications presented the specifications adopted by the Organization of City Officials for Standardizing Paving Specifications with some modifications deemed by them essential or desirable. Mr. E. H. Christ presented for the committee on brick specifications a brief progress report and a resolution, which was adopted, asking the National Paving Brick Manufacturers to express itself regarding a specification for standard sizes of bricks and blocks for street paving.

The association listened to a most interesting history of the progress of the work of devising a standard rattler for testing paving brick, given by Professor Edward Orton, of Ohio State University at Columbus, who is at work in his laboratory upon the matter for the National Association of Paving Brick Manufacturers, in conjunction and in parallel with Marion W. Blair, at Indianapolis, in the laboratory of the association. The difficulties that have been overcome, the present form of staves for the rattler and the program of tests to determine the best specifications for staves, shot, etc., were clearly and concisely set forth and, doubtless for the first time for most of those present, were put in shape for easy comprehension.

All of these reports will be given due space in MUNICIPAL ENGINEERING later.

The program of the third morning was transferred bodily to Friday, the fourth morning of the convention and was presented in full with but one or two exceptions.

E. A. KINGSLEY, VICE-PRESIDENT,
Little Rock, Ark.

The entertainment features were almost too lavish. Wednesday afternoon was spent on the bay, at the water works settling basins, the life-saving station, etc., and dinner was taken at the Country Club. This was so enjoyable, with the after-dinner speeches, that the evening session was omitted ,except the necessary election of officers. Thursday afternoon was given to automobile rides over the excellent streets of the city, which show the effects of an efficient system of street repair. The evening was spent socially, many attending a vaudeville entertainment as guests of the local committee. These two large breaks in the business program resulted in many desertions and, while the attendance during the first two days was large, that on the last day was very small. The ladies' committee headed

by Mrs. Briggs was indefatigable, and the visiting wives and daughters of members were strong in their commendation of the entertainment given them.

The exhibit feature was not quite so prominent as for the past year or two but was very interesting and instructive. The exhibitors were as follows:

Warren Brothers Company, Boston, Mass., represented by George C. Warren, president; G. M. Ingram and E. M. Robinson, of the Southern Bitulithic Co., Nashville, Tenn.; C. E. Kennedy, of Utica, N. Y. A notable feature in their exhibit was a table showing the increase in bitulithic contracts per year from 16,400 square yards in 1901 to 3,477,654 in 1910, equal to 800 miles of 30-foot roadway.

The Texas Company, represented by Harry Tipper, publicity engineer, New York, with paving cement, road oils and asphalts.

The Barrett Manufacturing Co., represented by James F. Ball and H. E. Rosenhild, of Pittsburg, Pa., with pitch fillers for pavements.

The St. Marys Sewer Pipe Co., St. Marys, Pa., with sewer pipe and fire clay goods.

The Union Clay Products Co., represented by A. L. Gillespie, president, and W. W. Dixon, 50 Church street, New York with a new joint filler for making water-tight sewer joints, a demonstration of the method of using being made on Thursday morning.

The American Asphaltum and Rubber Co., represented by Thomas M. Roche, 600 Harvester Bldg., Chicago, Ill., with Pioneer filler asphalt for brick and block pavements.

Walter C. Parmley, Everett Bldg., New York, with his system of reinforced concrete constructions for sewers, conduits, manholes, tunnels, etc.

The Lock Joint Pipe Co., represented by Coleman Meriwether president, and A. M. Hirsch, treasurer, 165 Broadway, New York, and B. F. Granger, Jackson, Mich., with their continuous reinforced concrete pipe.

The Dunn Wire-Cut Lug Brick Co., represented by F. B. Dunn, secretary, Conneaut, O., with his wire-cut lug brick, which was also used in the demonstration of the proper method of laying brick pavement with cement mortar filler.

The Standard Asphalt and Rubber Co., represented by J. F. McGuirk and H. B. Fisk, 205 La Salle street, Chicago, Ill., with filler for brick and block streets and pipe dip.

The National Paving Brick Manufacturers Association, represented by Will P. Blair, secretary, Marion W. Blair, Merle Sidener, Indianapolis, Prof. E. D. Rich, Ann Arbor, Mich., and W. T. Blackburn, Paris, Ill.

The Destructor Company, Power Specialty Co., manager, represented by Alexander Bradley, 111 Broadway, New York City, with booklet regarding their garbage destructors.

The Indian Refining Co., represented by A. B. Chamberlin, engineer, First National Bank Bldg., Cincinnati, O., with Indian asphalt binder for pavements using asphalt cement, asphalt road oil, heavy liquid asphalt for resurfacing old roads and emulsion oil for park purposes.

The Perry Iron Co., Erie, Pa., with slag for concrete, fireproofing, etc.

The Link-Belt Co., Chicago, with circulars regarding a portable asphalt paving plant.

Other representatives of business houses were: B. B. Colborne of the Equitable Asphalt Maintenance Co., Kansas City, Mo.; E. A. James of the *Canadian Engineer*, Toronto, Ont.; Dudley T. Corning of the Cambria Steel Co., Johnstown, Pa.; D. Warren de Rosay of the Corry Brick and Tile Co., Corry, Pa.; E. H. Goodrich of the Mack Manufacturing Co., Philadelphia, Pa.; H. L. Powell of *Good Roads*, New York City; H. B. Kirkland of *Engineering-Contracting*, Chicago, Ill.

The delegates present were the following:

Albany, Ga.: R. J. Edgerly, city enginer and superintendent construction.

Atchison, Kan.: Fred Giddings.

Auburn, N. Y.: J. Walter Ackerman, superintendent water works.

Birmingham, Ala.: Julian Kendrick; John M. McCartin, street commissioner; Maury Nicholson, city engineer.

Canton, O.: Phil H. Weber, city engineer.

Chicago, Ill.: Linn White, chief engineer South Park Commission.

Columbus, Ga.: W. C. Campbell, superintendent public works.

Columbus, O.: A. Winthrop Pratt, chief engineer State Board of Health.

Concord, N. H.: Alfred Clark.

Dallas, Tex.: E. L. Dalton.

Dayton, O.: F. J. Cellarius, city engineer.

Daytona, Fla.: D. D. Rogers, city engineer.

East Orange, N. J.: Fred A. Reimer, city engineer.

Erie, Pa.: Ben E. Briggs, city engineer; A. S. Pinney, city treasurer; Faulkner G. Lynch, deputy city engineer; Jesse Supplee; Miles R. Nason, councilman; J. H. Careaghan; F. E. Delano.

Grand Rapids, Mich.: L. D. Cutcheon; Edward H. Christ, Board of Public Works.

Hamilton, Ont.: Job Brennan, A. F. McCallum.

Indianapolis, Ind.: Charles Carroll Brown, consulting engineer and editor MUNICIPAL ENGINEERING.

Little Rock, Ark.: E. A. Kingsley, superintendent public works.

Meadville,, Pa.: B. F. Miller, Jr. city engineer.

Moline, Ill.: Clark G. Anderson, city engineer.

Montclair, N. J.: James Owen, county engineer; M. N. Baker, president Board of Health and editor of *Engineering News*.

Newark, N. J.: A. F. Eggers, A. R. Denman, Wm. Mungle, H. B. O'Conneil, Board of Public Works; C. V. Baumann, John B. Stobaeus, Board of Trade; E. S. Rankin, engineer sewer department; Wm. A. Howell, engineer street department; J. C. Hallock, assistant to chief engineer; M. R. Sherrerd, chief engineer; Lee Ottolinger, president, Wm. A. Baker, vice president, Market Street Business Men's Improvement Association; Wm. Rankin, engineer sewers.

Niagara Falls, N. Y.: R. A. McClanathan, city engineer.

New York, N. Y.: A. W. Dow and Francis T. Smith, chemical engineers on paving; C. D. Pollock, assistant engineer of highways; Rudolph Hering and George W. Fuller, consulting engineers; James H. Van Buren; J. W. Howard, consulting engineer; A. Prescott Folwell, secretary.

Oil City, Pa.: G. F. Roess, city engineer.

Pawtucket, R. I.: George A. Carpenter, city engineer.

Pittsburg, Pa.: C. F. Taylor; Chas. M. Reppert, engineer, N. S. Sprague, superintendent, bureau of construction.

Rochester, N. Y.: E. A. Fisher, city engineer; J. E. Putnam, assistant city engineer.

Syracuse, N. Y.: Henry C. Allen, city engineer.

Toronto, Ont.: C. H. Rust, city engineer; D. Chisholm, aiderman.

Troy, N. Y.: E. L. Grimes, city engineer.

Wichita, Kan.: Bert C. Wills.

Wilmington, Del.: L. V. Christy, Alex. J. Taylor, Frank W. Pierson, Chas. A. Rudolph, George W. Sparks.

Winnipeg, Man.: H. N. Ruttan, city engineer.

The officers elected were: Fred Giddings, Atchison, Kan., president; E. A. Kingsley, Little Rock, Ark., first vice president; Ben. E. Briggs, Erie, Pa., second vice president; Edward H. Christ, Grand Rapids, Mich., third vice president; A. Prescott Folwell, New York City, secretary; E. S. Rankin, Newark, N. J., treasurer.

The next meeting of the association will be held in Grand Rapids, Mich., probably in October 1911.

Exposed Sewers at Leavenworth, Kan.*

By Joseph O'Neil, City Engineer

IN designing main trunk and lateral sewers for sanitary sewer district Number Nine at Leavenworth, the latitude of the design was limited by a great many natural conditions. The district consists of several minor drainage areas and contains numerous creeks and "draws," making the topography of the district very rough and broken. At points where creeks cross alleys and streets, are located culverts and bridges, the crossing of which controlled the grades of the sewers almost absolutely. In addition to this, the several additions to the city comprising the district were poorly platted when originally laid out, and the arrangement of strets and alleys is bad; in some cases there are two and three alleys in one block, platted as "T" and "H" alleys; in other cases there are no alleys, and it was necessary to condemn right-of-way for sewers. In order to lay out the main trunk sewer so as to provide for lateral sewers in each block, the alignment was controlled entirely by these requirements, and the topography had to be disregarded for the most part.

Being thus controlled in grade and alignment, the depth varied from very shallow to exceedingly deep work, sometimes through twelve or fifteen feet of rock. In crossing creeks and ravines, it was often necessary to have the sewer above ground. These "exposed" sewers will be discussed in this paper.

*A paper before the American Society of Municipal Improvement.

It was deemed best to use light weight, bell and spigot cast iron pipe supported on concrete piers, and to provide for the free expansion of the pipe. To attain this end, it was provided that the piers be mounted with cast iron pier plates anchored into the concrete; on these plates were to be placed several lengths of round bar iron at right angles to the line of the sewer, to serve as rollers; and fitting over the top of the plate and rollers in such a manner as to secure the rollers from falling out, but at the same time to permit them to roll on the plate with the expansion and contraction of the pipe, a saddle to fit the outside diameter of the pipe.

To avoid placing piers in creek channels where they would obstruct the flow, it was necessary to get a wider panel than twelve feet, and a truss was designed to support the intermediate joint. The truss consists of clamp bands to fit the circumference of the pipe and hold the truss rods in place, a queen post and a set of rods as shown on the photograph. In estimating the cost of the work, it was found that the complete truss was less expensive than the pier with its necessary castings, so it was decided to make the panels twenty-four feet instead of twelve feet, and to use a truss between each set of piers. To provide further for expansion, it was decided in cases where there was more than seventy-five feet of exposed pipe in a span to place an expansion joint. The regular type of iron body, brass sleeve expansion joint was specified.

While the expansion in an iron pipe with a flow of sewage would be very small, owing to the almost constant temperature of the sewage, and might be taken care of by the "giving" of the lead in the joints, at the same time the loosening of the lead from expansion and contraction would cause leaks that would require attention later on, and it was considered necessary to install expansion joints.

In designing the special castings required for this work, every effort was made to have them simple, yet strong. To provide for different sizes of pipe, bushings were used where possible, or one casting only of a set was altered. This reduced the number of patterns required for the castings and kept the castings standard as far as possible. The castings required for the work were made by local foundries.

EXPOSED IRON PIPE SEWERS, LEAVENWORTH, KAN.

The unit contract price for this class of work were as follows:

10-in. light weight cast iron pipe in place, per ft.	$1.50
8-in. light weight cast iron pipe in place, per ft.	1.00
Trusses for 10-in. pipe complete and in place, each	16.50
Trusses for 8-in. pipe complete and in place, each	18.00
10-inch expansion joints complete and in place, each	55.00
8-inch expansion joints complete and in place, each	45.00
Concrete piers 5-ft. high or under, fully equipped with castings, each	22.00
Additional height of piers, per vertical ft.	3.00

The accompanying photograph shows a section of exposed sewer and a drop manhole entirely above ground, a complication arising from the conditions before mentioned.

The Present Use of the Septic Tank*

By Prof. Henry N. Ogden, Cornell University, Ithaca, N. Y.

IN 1896, Mr. Donald Cameron, City Engineer of Exeter, England, with two others, was granted patent rights in an apparatus or invention for the purpose of dealing with crude sewage bacteriologically and bringing it into such a condition of solution and liquefaction that it could be thereafter more easily treated by filtration or irrigation or any other suitable way. Before that time, tanks of various kinds had been in use not only in England but in other countries. For twenty-five years previously, chemical treatment had been the prominent method of eliminating from sewage the suspended matters which had been found to be troublesome, both on irrigation fields and in rivers and tidal estuaries. The bane of every superintendent in charge of a sewage disposal plant has always been the vast accumulation of sludge, which is generally produced faster than the land available can take care of it; and which does not readily lend itself to any other method of disposal. There was no great difficulty in purifying the liquid part of the sewage sufficiently so that it could be discharged into streams after the solids were removed, but to dispose of the solids, that was the trouble.

The value of Mr. Cameron's invention, the feature of his scheme which appealed to the city officials generally, was contained in this statement—"By this invention it is possible to get rid of the sludge difficulty because the sludge portion of crude sewage is entirely thrown into solution." His claim was based on experiments made in Exeter on a small tank 12 feet wide, 15 feet long and 2½ feet deep, and was expressed as above after seven months' operation. Since that time much has been learned about the operation of sewage tanks, generally dignified by the name of septic, and the recent lawsuits over the patent rights involved, as well as the papers before learned societies, have produced evidence and discussion covering not merely every detail of construction and operation of the tank, but even its very name. Engineers have considered the length of time during which sewage should remain in septic tanks, and many experiments have been made in order to arrive at some definite conclusion. There has also been a large amount of testimony presented from various parts of the world on the action taking place during the passage of sewage through the tank. That gases of various kinds were developed by this action was easily discovered, and one of the advantages at first claimed for this treatment was that the production of those gases would be a source of revenue to the municipality, replacing, to a large extent, the ordinary illuminating gas.

During the fifteen years since the patent was issued, many of the claims which originally were made for the invention have been disproved, and more extended and scientific experiments on septic action have been made. Further than this, experiments and experience both have combined to establish certain definite appreciations regarding its value, and it may not be out of place here to summarize, briefly, just what a septic tank may be expected to do and just what we know it will not do.

In the first place, we know definitely that it will neither purify sewage completely nor act as a panacea in eliminating sludge. Not long ago the writer was much interested in the enthusiasm of a western salesman who was dealing in plumbing specialties. He had found that, in order to secure sales, he must be prepared to advise customers on the subject of sewage disposal, and he was spreading broadcast recommendations, vouched for by himself as facts, to the effect that the installation of septic tanks would transform sewage of any degree of pollution into what, if not drinking water, might be considered equal to the quality of the average river. This is not true, and no one who has followed the experiments on tanks believes it to be true.

Nor does the septic tank do what Mr. Cameron thought it did, namely, eliminate the sludge difficulty. Inasmuch as the septic tank is, after all, a tank, there is inevitably brought about a certain sedimentation so that the liquid passing out of the tank is usually freed from a certain amount of suspended matter. To this extent the sewage is purified, and if filtration follows, the surface of the filter and possibly the interior of the filter is relieved of the usual clogging.

*A paper before the American Society of Municipal Improvement.

It was at first thought that the liquid, carrying material in solution, was itself affected by septic action and that certain anaerobic changes taking place in the liquid were desirable as being necessarily preliminary to later filtration. The English chemists and biologists have been inclined to cling to this idea and to divide all bacterial processes of purification into two parts, namely, one occurring in the septic tank, where liquefying and anaerobic bacteria should transform the crude organic substances into ammonias and nitrites, the other the aerobic filter bed, where these organic matters already started on the road to purification might be fully nitrified. The Massachusetts State Board of Health pointed out ten years ago that this theory was not always tenable, since in their experiments it happened very often that no better results were obtained on filters dealing with septic sewage than filters dealing with crude sewage. Further than this, it was pointed out by them that if the action in the septic tank proceeded too far, subsequent filtration was thereby more difficult and less complete, and this belief has extended until to-day the original claim of Cameron has been almost forgotten and the fact that so far as the liquid portion of the sewage is concerned septic treatment is immaterial if not objectionable, has been fully substantiated.

What, then, does the septic tank accomplish? Simply this: It manages to exert an action upon the material which is settled out of the sewage as it passes through the tank, not to the extent of destroying it all, as Cameron claimed, but to the extent of liquefying or gasifying about one-third of those solids. It was, and still is, by some, believed that a septic tank never requires to be cleaned out; that in some mysterious way the bacteria destroy all the precipitating solids. This is far from being a fact, since no bacteria can act on mineral matter, of which some is always present in sewage; nor can they destroy the humus-like material into which the organic material is converted. There is inevitably in a septic tank an accumulation of solids proportionate in volume to the flow of the sewage, provided such solids are retained in the tank. One can be very sure that where such an accumulation does not take place the solids are being carried out of the tank by the flow of the sewage and are being deposited in a finely divided state on the surface of the filter beds, where they do more harm than if they had been carried out in their grosser and coarser condition.

The septic tank, then, is valuable in that it acts as a sedimentation tank, incidentally equalizing the flow of sewage, and in that it may eliminate about one-third of the precipitated solids. Unfortunately, if the flow of sewage through the tank is so slow as to permit the destructive action to reach its maximum effect, there has been found a resulting action in the liquid of the sewage which poisons it so that subsequent treatment of the sewage is made more difficult. The odors of the plant are always increased also if the septic action is pronounced. Therefore, the designer of the tank is almost at a loss to know whether the tank of small size, which minimizes the action on the liquid, or the large-sized tank, which emphasizes the action on the solids, is the more desirable. The most intelligent management to-day seems to tend toward the use of small tanks, through which the velocity is comparatively high and where sedimentation takes place, without, however, allowing room for any accumulated solids. Such tanks are made with inverted conical bottoms, at the vertex of which the deposited material is found. By connecting this vertex through a pipe with another tank at a slightly lower level, the solids may be drawn off into a special receptacle, where septic action may be continued on the solids alone as long as the capacity of the second tank allows.

In the Travis tank at Hampton this division of solid and liquid is accomplished by dividing the tank by a horizontal partition, so arranged as to leave a slit or opening between the sides of the tank and the partition. By means of two valves, one opening from below this partition and the other from above, the velocity of flow through the two parts is controlled, and it is managed so that the velocity through the upper part, comparatively free from suspended matter, is much greater than the velocity through the lower part, which contains the organic matter on which the tank is expected to act.

In those cases where continuous operation is claimed for a period of years without any accumulation of deposited material, one may be sure of finding in the effluent small black particles, which represent the inevitable loss of deposit to make up for the accumulation of new material. This fine material, as is generally the case with the solid matter acted on in the tank, is comparatively free from odor and may

be dealt with far more easily than the raw sludge, and this may be said to constitute another advantage of this tank treatment. Altogether, the value of the septic tank has been much modified since its invention, and inasmuch as the present feeling among engineers and managers is that septic sewage is not desirable for after-treatment, and that in every case a tank should be emptied of sludge at least once a month, provided subsequent filtration is practiced, the claims of the holders of the septic tank patent rights are not of as much interest as when the value of those patent rights was more highly considered.

Pollution of City Water Through Check Valves on Private Fire Protection Plants*

By J. Walter Ackerman, Superintendent of Water Works, Auburn, N. Y.

THE subject of possible contamination from polluted auxiliary or secondary water supplies used for fire protection through the check valves has received attention lately by both the New England Water Works and American Water Works Associations. And while there seems to be a division of opinion as to the advisability of having secondary supplies connected with the general system, its adherents admit that to meet sanitary requirements the check valves must be practically infallible in their operation. And when mere man attempts to make something in this class, he has mapped out for himself a fairly large sized contract.

Without in any way attempting to take sides in the matter of whether it is advisable to have the secondary supplies connected with the general city water system, I will discuss it solely from the point of its being connected, and the relations of the check valves thereto.

Generally speaking, I believe the papers before the societies of this character usually represent some item of the writer's experience. This is true in my own case, and a short sketch of that experience will better show you a reason for the development of the check valves in our system.

The city of Auburn, N. Y., is a town of about 36,000 inhabitants, and is situated in the Central New York lake district, on the outlet of the Owasco Lake. This lake has a drainage area of about two hundred square miles, and an impounding capacity of about two thousand million cubic feet available for power purposes; and the topography of the city is such that there is about two hundred feet fall in the outlet of the lake as it passes through the city, hence it furnishes good water power, and in the natural development of the town many mills and factories were built upon this stream, on account of its abundant water power privileges, so that it came to be a manufacturing city. Also, this same stream became the receptacle for the discharge of all the sewage in the city. So, you will note that for the ordinary secondary supply, most of the mills and factories secure it from this sewage polluted stream.

In the spring of 1908 there was a small epidemic of typhoid fever, and the Water Commissioners employed a sanitary expert to trace out the source of the same. But his report, rendered some months later, which showed evidence of careful research, did not show any positive proof of the source of the epidemic. But on account of the fact that no carrier was as common as the water supply, the probable cause of this epidemic was ordinarily laid to the city supply. Further investigation later, by other sanitary experts, failed to add any further information, and corroborated the first expert's opinion.

The writer assumed the duties of Superintendent of the Auburn Water Works in September of the same year, but was familiar with the situation, as he had served in the capacity of City Engineer for a period of six years. After being in office for a short time, it was learned that some of the men in the factories claimed that they did not like the drinking water after a fire drill. This led to an investigation, and it was found in this particular locality that while the secondary supply was not from an infected source, it was stagnant water, and the weekly fire drills would fill the fire lines full of this water, and the employees would

*A paper before the American Society of Municipal Improvement.

drink the same. This incident was the starting of an investigation of all the mills and factories, to learn if there was any chance for the polluted water of the secondary supplies reaching any of the operatives of the mill, or passing out into the main lines of the water works system.

In about a dozen of the factories that have secondary fire service equipment, the following is the general type:

In the street bordering the factory or mill site, the mains of the city distribution system, generally 12 inches in size, are located at a depth of about five feet underground; either at one or two points on this main, a connection is made from four to twelve inches in diameter, depending upon the amount of water needed for fire protection, proportionate to the size of the factory. Most of the original installations generally had an indicator post on the gate valve, which closed the leader running into the factory, but which was used only at such times as repairs were being made, as the efficiency of the system depended upon this valve being open at all times for immediate use. After the water passed through the above mentioned gate valve on its way to the factory, it next passed through a check valve, which was so placed as to allow the water to pass freely through it on the way to the factory, but which was supposed to close tightly if a current of water passed in the opposite direction back toward the city main.

The pressure for the supply of the city is furnished by pumps, and whenever a fire alarm is sounded, of which the pumping station gets the same alarm, the pumps are speeded up to increase the pressure for fire fighting purposes. The normal city pressure varies from fifty to ninety pounds, depending upon the locality; but in the district where the factories are located the lowest pressure is perhaps normally sixty, and the greatest about eighty-five. But at times of fire this pressure is increased about thirty pounds.

During the course of the investigation, it was found that the underwriter's pumps installed for giving an increased pressure and a secondary supply, at the factories, generally had their relief valves set from ten to fifteen pounds higher than the city fire pressure. When the examination of the check valves was started we found that usually they were all buried in the ground, the same as the water pipe and other similar specials, as gate valves, tees, etc., so that no inspection had ever been made of them since their installation, some of them having been in use nearly twenty years, although subsequent events did not seem to prove that a long installation gave any more leaks than those installed for shorter periods of time. But other factors entered into this which may have made the difference, viz: the older valves were of smaller sizes, and of different manufacture, than those of recent use.

The general installation, as before noted, was typical of all of the secondary supplies in the city, and I found that the insurance regulations required that the underwriters fire pump must be brought up to sufficient speed so that the relief would discharge; this to be done at least once each week.

On being present at these tests, the writer found that the pump taking its supply from the polluted river above mentioned would bring the entire factory supply system up to the pressure at which the relief of the pump was set. So, at the time of testing, all of the fire pipes and mains in the factory and factory yard were the same pressure as that created by the pump. At such a time this pressure would always be more than that carried by the city mains, consequently the water inside would tend to go out into the city main if the check valve did not properly operate to prevent it. At the time of an actual fire or an actual test of the entire system, as conducted by the insurance inspectors, the entire system is filled with polluted water, as the different hose conections in operation would soon empty the supply of city water stored in them, which would be replaced by the polluted water of the river. This, in turn, they would attempt to flush out by means of allowing the city water to then flow through the system after the pump had ceased operation.

In order to study the situation, the check valves were all exposed, and taps were inserted in the pipe lines between the check valves and the gate valve with the point indicator before mentioned. Then, by varying the pressure inside the factory, it could be determined whether water came back through the check, and out through this tap, with these variations in pressure. Many samples of water were collected. Some of these check valves seemed to close absolutely tight; but those that would close tight one day, did not seem to be tight the next, and vice versa. Generally speaking, however, the larger the check, the greater

the disposition to leak; and in some cases they were notoriously bad.

Bacterial examinations which were taken at this time showed polluted water going back through the check valve into the city main. After these examinations were concluded, Mr. George C. Whipple, of New York, who was making a complete sanitary report on the entire city system, was asked to examine the check valves, and look over the results already obtained. The result of his report was such that the Water Commissioners felt that contamination was liable to result from the continuance of the installation as then existing; and so all factory and mill connections were ordered discontinued if the secondary supply was to be used in connection thereto. This, of course, met with opposition on the part of the factory owners. And after appealing to the insurance interests, they recommended double check valves, in place of the ones previously used. This concededly better equipment was not endorsed however by the Commissioners, but critical examinations of these new double check valves showed that there were many points for improvement in design, as tuberculation of corroding surfaces was liable to cause the same condition of affairs as was found in the single valves. A hearing was given to the insurance and factory interests, and finally the entire matter was turned over to the Commissioners' experts and the insurance experts.

On receiving the report of this conference, the Commissioners modified the original order of discontinuance, and adopted a special design in double check valves submitted by the experts of the insurance interests.

As the situation now stands, these specially designed and constructed double check valves are installed on all fire service connections where secondary supplies are used, and placed in accessible brick or concrete pits, so that inspection may be made by agents of the Water Board, the factory owner to pay all such expenses, the normal test being a test for leakage, but at least every six months the valves are dismantled and examined to see if there is any chance for further improvement in design, or if they are in any way actually faulty under the present form.

Some of these double check valves have been installed for six months or more. Generally speaking, the difference between these valves and the original type is that in the present instance the clapper, the holding ring, the pin, the bushing and the seat are all made of bronze, and a rubber disc is used to make the same tight, this disc being made of a composition similar to that used in the Grinnell dry valve system. The cast iron body of the check valve is enlarged to such an extent that the space between the clapper and the walls is much larger than formerly, so that any of the tubercles forming upon the cast iron surfaces could not possibly reach out for enough to keep the check valve from operating.

One other condition is that the valves should be at least eighteen inches from center to center. This has the tendency of being far enough apart so that any stick which could travel in the pipe after it got into the same would be less liable to keep both of the valves open if it happened to stop at that place.

For testing the valves, three pressure gauges and two drips are employed. The first gauge is between the indicator post gate, which shuts off the supply from the city pressure, and the first check; the second gauge is between the checks; and the third gauge is beyond the checks. The first drip is between the indicator post gate above mentioned, and the first check; the second drip is between the checks. So that by the use of the above mentioned indicator post gate and the drips and the pressure gauges it can be determined whether there are any leaks in the check valves or not. The actual monthly inspections show that in general these checks are tight, although it is very rare in making the rounds, but what one or two will show a leak, and several times on examination of them, have failed to give any adequate clue to reasons therefor. Other times, small pieces of jute or other refuse have been found upon the seat or face of the valve. And it is very seldom but what these checks can be made to close tight by flushing them out with a quantity of water. But in some instances, this even fails. And today I have one or two checks which I cannot make close absolutely tight every time. However, at no time have I found two check valves in one line at one time which did not work. This, of course, shows the wisdom of using the two checks.

However much this improvement is over and above the old type, it is, I believe, more the accessibility and inspection that renders them so much more reliable than the older type. It would seem on examining one of these checks in its finished state, that it was almost impossible to make a better one, or that there were any chances for

improvement. And in the six months' experience which I have had in testing them, while they are not infallible,as you will note, still, there is no situation which has arisen which would call for any material change in the design. But I am still confronted with the fact that they are not all working correctly all the time. And it would seem that, notwithstanding all of the improvements, that the only safe way is a frequent test and examination to determine that they are in proper working order.

Sidewalk and Curb Grades *

By Clark G. Anderson, City Engineer, Moline, Ill.

UPON unimproved streets the sidewalk grade problem would appear as a very simple proposition of grades and their intersections. As soon as the roadway curb makes its appearance, or upon streets where the curbs are in place, the question of sidewalk grade comes forth with an astonishing variety of combinations, and especially so at street intersections.

As an illustration I might ask, "What should be the elevation of grade for the intersection of two walks at a corner from which one curb ascends at the rate of 4 per cent. with the walk 10 feet distant, and the other curb descends at the rate of 8 per cent., with the walk 4 feet distant from the curb?" In this particular case we will have one of two possible conditions: either the walk on one of the streets must be depressed below the curb on that street, thus draining the parking on to the walk, or, if the walk be raised so as to drain the parking to the curb, it will necessitate either steps or a very sharp incline to meet the conditions at the cross street.

The elements to consider in the establishing of sidewalk grades should be:

1. Service to the public.
2. Hazard to the municipality from the standpoint of personal injury damage suits.
3. Benefit and damage to the abutting property.
4. Beauty of the street.

In considering service to the public it is not sufficient to take account only of what the ordinary able-bodied person is capable of doing, or what the public is willing to tolerate, but honest effort should be given toward bringing the walks provided for pedestrians to such condition that the blind, lame, aged and women with children may travel along the same with reasonable assurance of safety and with the least effort.

Volume of traffic may enter into the question of service to the public, as excessive slopes, steps and other necessary devices that may be permitted on residential streets of limited extent and traffic, might prove hazardous, objectionable and intolerable on business streets.

Uniformity in general plan is also worthy of consideration, as man is more or less of an automaton in his actions. Provide one or two of the eight gutters at a street intersection with crossing plates, and you will find many people stumbling there, especially if the street light happens to be out of commission; or let a cross-walk drop on an excessive grade at such a place, and people will be continually slipping there, on the same principle that your foot will always discover the faulty riser in a flight of stairs.

The public at large is disposed to ignore the principle of law as applied to reasonable care to "stop, look and listen," and expect their servants to provide means of travel of such character that this principle need not be invoked by them. We say it is impossible, but many a costly judgment in personal injury suits could have been spared municipalities if a little more attention had been given these insignificant details.

In cities of rugged character, topographically, the question of damage or injury to the abutting property, due to determining sidewalk grades, and location of the walk as well, often becomes very troublesome. This is especially true on streets where retaining walls have been carelessly built to support terraces, or where buildings may exist close to the street line. Having found a happy reconciliation of utility, safety, damage, and beauty of the street, under such conditions the

*A paper before the American Society of Municipal Improvement.

engineer may well grin defiance at the most intricate problem in the higher mathematics.

No one may say, in these days of aesthetic endeavor, that the beauty of the street should be neglected for the sake of utility. But the engineer, having determined upon a reasonable compromise in the establishing of a difficult sidewalk grade, is rather disposed to say, with the fellow in prison for smiling at his neighbor's wife, "To perdition with beauty! See where it lands me!"

When other modifying conditions may be ignored, there are three combinations of circumstances under which hard and fast rules may be laid down for the relationship between sidewalk grade and curb grade, namely: where intersecting curbs approach a block corner on a level; where intersecting curbs approach a block corner on equal, or substantially equal, descending gradients, and where intersecting curbs approach a block corner on substantially equal ascending gradients. It is readily seen that there are three other combinations, namely: where a level curb intersects a curb on descending gradient; where a level curb intersects a curb on ascending gradient, and where a curb on ascending gradient intersects a curb on descending gradient, any or all of which conditions upset any fixed rule for this relationship. The three last named combinations are more frequently met with than are the three first named.

The first determinations to be made are, satisfactory transverse slope for the walk and desirable incline of the parking or that portion of the walk space between the walk and the curb. There is some difference of opinion among engineers as to what these slopes should be. As the writer is using one-quarter inch per foot, or the equivalent of 2.08 per cent., for transverse slope in the walk, and a minimum of one-half inch to the foot, or the equivalent of 4.17 per cent., for the slope of the parking on streets used for residential purposes, these figures will serve as well as any others for the purpose of illustration.

The only useful function of the transverse slope is to drain surface water to the street gutter. This will not be accomplished in the case of walks on level or low grades, using the figure given for minimum in the parking, unless the earth surface is left somewhat lower than the top of the walk, in case the parking is seeded, as the sod will form a mat higher than the edge of the walk, that effectually dams the water and prevents its flow to the gutter.

In dealing with transverse slopes we find that the maximum incline in a walk on level grade is the transverse slope perpendicular to the direction of the walk, and that as the grade increases, the maximum incline shifts with the width and slope of the walk, so that on excessive grades we find the surface water flowing nearly parallel with the center of the walk.

The direction of this maximum incline may be defined as the hypothenuse of a triangle of which the width of the walk is the altitude and the base is the width of the walk multiplied by the ratio of the percentages of the walk gradient and the transverse slope. For example, given a walk 6 feet wide on a 10 per cent. grade, with a transverse slope of ¼ inch per foot, we find that the ratio of percentages of gradient and slope, multiplied by the width of the walk, equals 28.8 feet, and that the surface water will flow diagonally from one corner to the other of a stretch of walk 28.8 feet long. Pursuing this a little farther, we find that this diagonal is on an incline of 10.21 per cent., as against the prescribed 10 per cent. longitudinal gradient. The combined effect of transverse slope and longitudinal gradient is to increase the prescribed incline of the walk, and to lead the surface water on and along the walk instead of across it, both of which results add to the hazard and discomfort of the public using the walk.

It would therefore seem reasonable to require that surface drainage should be confined to the shortest path across the walk, wherever possible, and that a limiting angle should be fixed, beyond which it should not be permitted to go. Assuming that the path of drainage be confined between the limits of 90 degrees and 45 degrees with the direction of the walk, substituting the value of any required transverse slope, making the base equal to the altitude, and solving for per cent. of grade in the formula given, we find that in each case the limiting grade is equal to the transverse slope. This relationship may be best shown by the following table:

Transverse Slope, Inches per Foot	Per Cent. of Transverse Slope; Also Limiting Grade	Inclination of 45 Degree Diagonal Per Cent.
1/8	1.042	1.47
1/6	1.389	1.96
1/5	1.667	2.36
1/4	2.083	2.94
1/3	2.778	3.93

It will be observed that the inclination of the 45 degrees diagonal is in all cases approximately 40 per cent. greater than the corresponding transverse slope.

This table gives us working limits for any assumed slope. Thus, assuming that ¼ inch per foot is the minimum permissible slope for satisfactory drainage, and ½ inch per foot is the maximum permissible slope, we find that ¼ inch per foot may be used on grades from 0.00 up to 2.08 per cent.; that 1/5 inch per foot may be used on grades from 1.48 per cent. (interpolated) to 1.67 per cent.; that 1/3 inch per foot may be used on all grades less than 2.78 per cent.; that ½ inch per foot may be used on level grade only, and so on for any of the other slopes, if the cross-drainage is to be confined to the shortest reasonable paths across the walk.

If the surface drainage could be confined to the amount of water falling on the area of the walk alone, if it was uniformly distributed, or if the walk is of short length, the issues here raised would be without point, but this is rarely the case. Property owners will spend considerable sums of money in leveling their premises so as to drain away from the dwellings and toward the street. Private walks and driveways are often water collectors, discharging upon the public walks, with no regularity of interval and in such manner as to often make the walks unduly hazardous during the cold and wet season. This drainage also has a tendency to wear fixed water courses along and in the walk. For these reasons all effort should be made to rid the walks of water as quickly as possible, and the method here offered will apply to grades up to 4 per cent.

Again, the principles enunciated are sufficiently obvious to most of us to be axiomatic, but it is not unusual, in formal sidewalk specifications, to find requirements for transverse slope, without regard to grade. The average contractor engaged in this class of work will blindly follow a "rule of thumb," with acquiescence on the part of the average inspector allotted to the engineer, unless explicit instructions to the contrary are issued.

How should walks laid on grades in excess of 4 per cent. be treated?

At first glance it might appear desirable to give the walk a crown similar to that prescribed for pavements, in order that the middle of the walk, which is also the path of the greatest number of pedestrians, may rapidly shed snow, ice and water. It might also appear less objectionable to have a gradually increasing and curved incline on either side of the center, than to have all of the incline in one direction across the walk. As the principles already stated for transverse slope apply with the same force to a crowned surface, and for the further reason that this form of construction would have to be built with greater care than is usually accorded this class of work, and at a greater expense, this idea may be dismissed without further comment.

The answer to this question appears to lie in restricting the amount of surface drainage to the area of the walk by either providing suitable depressions in the earth surface on either side of the walk, or laying artificial drains to serve the same purpose. The walk should then be laid without transverse slope, as the longitudinal incline is sufficient for purposes of drainage.

In connection with the subject of slope in the parking, brief mention may be made of the admissibility of steps in sidewalk construction. As a general proposition the writer is of the opinion that they should be avoided wherever it is possible to do so. They are from 400 to 500 per cent. more costly than walks of the same area, exclusive of proper guard rails; they add to the expense of maintaining the parking by creating excessive slopes; they subject the public to needless hazard in sleeting weather; they are dangerous to persons afflicted with bodily infirmities; they add to the lighting bill of the city. The objections apply to all ordinary conditions. Situations undoubtedly exist where steps afford the only possible convenient means of ingress or egress for the public from one street to another, or from one section of a city to another. On residential streets of short extent, where the lot lines may lie parallel with terraces, and where the street walk may be placed at a considerable distance from the curb, steps may be used with good effect. Cement walks with a float finish, brick walks laid of unglazed brick, and cinder walks, on grades as high as 12 per cent., and possibly higher, may be used by the public with no apparent discomfort at all times, except when the walks are covered with ice, and the insertion of steps for the purpose of reducing the grades would appear to be of doubtful economy. Limestone flags and walks constructed of glazed tile, in vogue in some sections of this country, are slippery in wet weather on relatively low grades. There is one feature of the prescribed slope for park-

ing that deserves consideration in communities of rapid growth, where certain streets in the residential districts are so located as to invite invasion by business houses. In such localities the slope in the parking should be held down to the minimum commensurate with satisfactory drainage, in order that the walk may be extended out to the curb without creating an excessive inclination or needlessly require building up over the top of the curb.

Given two walks, A and B, located parallel with corresponding curbs, a and b.

Let Aa equal distance between curb and walk A.

Let Bb equal distance between curb and walk B.

Let Wa equal width of walk A.

Let Wb equal width of walk B.

Let Sa equal per cent. of slope in parking for A.

Let Sb equal per cent. of slope in parking for B.

Let IA equal transverse incline in A in percentage.

Let IB equal transverse incline in B in percentage.

Let %a equal per cent. of grade of curb a.

Let %b equal per cent. of grade of curb b.

Let ab equal elevation of grade at intersection of curbs.

Let AB equal elevation of grade at intersection of walks.

Then, for walks of equal width and equidistant from the curbs, when the curbs leave the intersection on equal ascending grades, and with uniform slope in the walks and uniform slope in the parking, for both cases, AB equals ab plus (Bb plus Wb) %a plus (Aa) Sa plus (Wa) IA.

The symbols here used are applicable to requirements for walk A.

While this formula, and others that will be referred to, may seem long and involved, a mere glance will show that they require but the simplest of arithmetical operations in their solution and that the symbols are used simply for brevity.

For walks on level grades the second term, (Bb plus Wb) %a, is equal to zero, and therefore drops out. For curbs on equal descending grades the second term, (Bb plus Wb) %a, is prefixed by a minus sign. In other respects the formula is the same and may be used for the three conditions.

If one walk is wider than the other, and (Bb plus Wb) is equal to (Aa plus Wa), satisfactory results may be had by taking the mean of AB, as obtained by the formula as written and when B and b is substituted for A and a. It must be borne in mind, however, that where the curb grades exceed 4 per cent. the slope in the parking should be reduced on ascending grades in order to avoid excessive inclination at the approach to the curb.

If the walks are of the same width, but walk A is remote from the curb and walk B is near the curb, where the curb is on level grade, then AB is obtained by inserting in the formula the nomenclature applicable to the walk B (nearest to a curb). In case this determination leaves little or no slope in the parking along walk A, the grade equal to

$$\frac{\text{(Bb) Sb plus (Wb) IB}}{\text{Bb plus Wb}}.$$

should be extended through point AB, to an intersection with the regular gradient of walk A. Solving the formula for AB for both walks and subtracting the result obtained for the near walk from that obtained for the remote walk, we find a certain difference in elevation, which, divided by

$$\frac{\text{(Bb) Sb plus (Wb) IB}}{\text{Bb plus Wb,}}$$

gives the distance from the point AB to the grade intersection. We thus find that walk B has one controlling grade point located at the walk intersection, while walk A has two, one of which is located at the intersection of A and B and the other at some distance therefrom, at the intersection of the two gradients. If the curbs in this case depart from the intersection on substantially equal ascending grades, the formula should be applied for walk B, the same as for level curbs, and the AB so found should be used for controlling grade for both walks A and B. If the curbs in this case depart from the intersection on substantially equal descending grades, the formula may be applied in the same manner as for ascending grades, except where this result causes a reverse slope in the parking along the remote walk, when two controlling grade points in the remote walk A should be determined as described in a previous case.

It is not the intention of the writer to go into wearisome detail of this whole subject. The variations in the relationship between sidewalk and curb are almost infinite, but the general principles to be borne in mind in the solution of any given problem are not many, and can be applied to almost all combinations. His purpose

is to lay stress upon matters often disregarded because of their seeming insignificance, and to aid in securing proper recognition and rational treatment of the sidewalk question.

The sidewalk is in reality the most important surface structure on a street, for the vast majority of the public travel on foot. Many a family has lived through generations without owning a vehicle of any kind. The householder may carry his drink, food, raiment, and even his furniture, fuel and building materials without the use of a road, but he cannot be deprived of a foot path leading to his home or to his means of livelihood.

Serving so many of us, it does not seem unreasonable to ask that the sidewalk be given a place of equality with and that it receive the same application of professional skill in design that is accorded to that part of the street devoted to the use of brutes and vehicles.

One does not have to travel far and wide, nor to observe sidewalks in many cities, to find horrible examples in sidewalk grades and be impressed with the inequality that exists in this matter, and which is generally occasioned by indifference and neglect of some one.

The location of walks with reference to curb lines and property lines is often considered an executive duty, in which case the engineer may not be consulted, and the location is fixed by some arbitrary rule. By applying the methods previously discussed for the determination of sidewalk grades at street intersections it will be readily seen that the location of the walks with reference to the curb lines may be rationally determined by the gradients of the intersecting and adjacent curbs.

Reversing the operation heretofore described, the required elevation of grade for curb intersections may be determined from given conditions for sidewalks. We thus come to the question of establishing curb grades, and it may be pertinent to inquire if it is sufficient to prescribe elevation of grade for curb intersection only, and use uniform grade for curb throughout a block in all cases, or, if it would not be well under certain aggravated conditions to break grade at intersection of walks with curbs, in order to modify steep walk approaches.

It is quite customary in small towns and in certain rapidly growing sections of the larger cities, where there is not immediate call for paved or curbed streets, to establish walk grades without regard to how a future curb grade may fit. Again, such places may have established grades for curbs, with no regard as to the possibility of placing a future walk at a desirable grade. Either of these conditions, upon the ultimate completion of the street improvements, gives rise to situations that have all the earmarks of unsightly, inconvenient and objectionable patchwork, against which the public may with justice protest.

Bituminous Pavements, Patented and Otherwise*

By E. A. Kingsley, Superintendent of Public Works, Little Rock, Ark.

IT is not necessary in a discussion of this subject to go into the study of asphalts and coal tars. It is my desire only that your attention be called to the fact that modern bituminous cements, under various names, are but new names for a very old thing. So far as the writer has been able to learn, however, bituminous cement or bitumen for paving purposes is of latter day origin; and, while the ancients knew of the cementing qualities of bitumen properly used, the thought of using it for the purposes of street paving never occurred to them, and it was left to man in the nineteenth century to find what a valuable asset this material is when properly used for paving purposes.

Probably the first bituminous pavements in the United States were laid in Brooklyn late in the sixties, the outgrowth of sidewalks built under the old Scrimshaw patents. The foundations consisted of broken stone mixed with stand, cinders and tar; the wearing surface was the same mixture, but the stones used were not to be larger than one inch. These pavements were remarkably good and lasted many years. So long as a good quality of coal tar could be obtained

*A paper before the American Society of Municipal Improvement.

good pavements could be laid, but when good cemented material was not used poor results were obtained.

[The writer here skteches the history of asphalt pavements from Edward Joseph DeSmedt's patent of May, 1870, through W. H. Foye's of November, 1870; those of Frederick E. Mathews, of Chicago; A. B. Vandemark, of Jersey City, and James M. Hawes, of Covington, Ky., issued in 1871, using crushed stone or shells, and Aaron Van Camp in 1876, who was awarded a patent, the particular point of which seems to be that crushed stone, graded as to size, will make a more compact mass and a better pavement than smooth surfaces not graded as to sizes. In other words, the voids may be lessened by Van Camp's method.]

The early coal tar and asphalt pavements were all what we now know as bituminous macadam or bituminous concrete pavements, and it was not until Mr. DeSmedt had laid his experimental pavements in 1869-70 that a wearing surface of pulverized rock and bitumen or sand and bitumen was used, and it is from these DeSmedt experiments and pavements, which were an attempt to imitate the European lime rock asphalt, that our modern sheet asphalt pavements have grown.

So many failures of coal tar pavements had been made that the successes were overlooked, and the DeSmedt successful experiments led to the adoption of his pavements by the authorities at Washington, and from Washington the asphalt pavement industry, as it has been known, spread all over the country. The older methods, excepting in isolated districts, were forgotten and the successful Vulcanite pavements were not duplicated. There were a few splendid pavements laid, however, in different parts of the country which kept alive the old and tried methods; around the old cathedral at Eighth and Plum streets, Cincinnati, O., is a bituminous concrete pavement which has been in constant use for nearly fifty years. This pavement is composed of a mineral aggregate of crushed stone, graded from one inch down to an impalpable powder, gravel, sand and coal tar. It is in good condition today.

The old Vulcanite pavements were made of the same material as the Cincinnati cathedral pavements, but the cementing agent was sometimes asphalt and sometimes coal tar. In a number of cities these Vulcanite pavements gave excellent service and in many places they are still in use.

In 1891 and 1892 a number of alleys in the downtown district of Denver, Colo., were paved with asphaltic concrete. The writer having lived in Denver several years is more or less familiar with these pavements. They consist of a mixture of crushed stone or gravel, sand and an asphaltic cement, mixed in proportions that produce a solid mass, and while in some instances a light wearing surface was made of screenings and sand with asphaltic cement, in every instance the mixture was made in a mixing machine and placed in the street as are what we know as our asphalt pavements of today. These pavements were all made and laid under the supervison of Marcus M. Hodgman, superintendent for the Blake Asphalt Company, at that time of Denver, Colo. Mr. Hodgman had for years experimented with asphaltic mixtures and the proportions of sized rock and cement were carefully looked after.

The city of Pittsburg, Pa., has undoubtedly more old asphaltic concrete pavements than any other city; thousand of yards of which have been in use since the early nineties. Much of this old pavement is in constant use and in almost perfect condition today —while adjacent to a great deal of it can be found the modern "sheet" asphalt pavements, which have been laid at later dates and many of which have worn full of holes.

Of the latter day bituminous pavements there are so many, patented or otherwise, that one needs a pocket index to keep track of them.

With modern crushing plants and modern machinery it is possible to produce a better mixture today with fewer voids than it was twenty or thirty years ago, and pavements of like character today should, in the same degree, be uniformly more perfect. But while the modern methods and modern machinery should have lessened the costs of these pavements, owing to the fact that F. J. Warren succeeded in 1901-2-3 in patenting this old method of paving, the costs have been increased rather than decreased, and, on account of threatened litigation, cities and contractors have been kept from laying these pavements. In other words, the various bitulithic companies, having an ideal pavement, have been free to charge all that the community could stand, regardless of the worth of the pavement, or the cost

of its construction because of the patents.

[The writer here quotes from the specifications of Mr. Warren's patents.]

The writer has no fight to make on bitulithic pavements; on the other hand, we believe that properly built bituminous concrete or bitulithic pavements are absolutely the thing. The theory to the writer's mind is correct, but the patent is wrong and has worked and may work hardships on contractors and communities.

Now a little more history.

From 1891 to 1898 Mr. Frederick J. Warren was manager of the Colorado Paving Company, at Denver, and the representative of the Barber syndicate. During 1891-92 while Mr. Hodgman was laying asphaltic concrete for the Blake Company in Denver, Mr. Warren was fighting the proposition as a failure and bringing all of his backing to bear upon Mr. Hodgman and the Blake Company.

In 1892 Mr. Warren was called upon by the city to tear up a portion of the Denver tramway tracks in Curtis street, between Seventeenth and Nineteenth, and he personally took charge of the work. However, he found the asphaltic concrete so tough and the job so difficult that he gave it up after four hours' trial with but little accomplished and the company went ahead with its work, leaving the tramway tracks with the asphaltic concrete pavement between them. This pavement remained intact alongside the Curtis street asphalt until 1898, when it was removed with the tracks on account of an entire reconstruction of the tramway company's lines.

But what of Mr. Warren? He evidently had changed his mind, for in 1901 he applied for a patent on the pavement he had denounced so thoroughly ten years before, and, in the light of the nine years since 1901 he did wisely. The writer does not believe that he was entitled to the patent; Marcus M. Hodgman had showed Mr. Warren what could be done but Mr. Hodgman did not want a patent. However, Mr. Hodgman died in 1897. Mr. Warren left Colorado in about a year after and in 1901 he received his patent.

[The writer here epitomizes the Owosso case heretofore reported at some length in MUNICIPAL ENGINEERING.]

I have followed the several suits that have been brought by Warren Brothers Company to restrain cities and contractors from laying bituminous concrete pavements, and it is my understanding that in no case has there been introduced any evidence to show the use of bituminous concrete mixtures for paving roadways prior to the Warren patents. In each case when this evidence has been at hand there has been an agreed decree entered as in the Huntsville and Birmingham suits, and those at Topeka, Kan., and Creston, Ia. In the Topeka case affidavits were filed claiming that if the defendant was allowed to proceed and lay the bituminous concrete pavement as contemplated the plaintiff would receive irreparable damage, such a pavement mixture would infringe upon their said patents, etc., but when the defendants were able to force an issue and get the case set for a hearing on its merits, over the protest of the plaintiff, the bitulithic attorneys made haste to bring about an agreed decree, allowing the defendant to proceed with his work. The only stipulation against the defendant was that he should lay a mixture which was described by Mr. Kirschbraun, of Chicago, as being the results of his examination of Denver and other pavements examined by him as expert for the court. As the defendant had bid upon the same specification, this decree, signed by Judge McPherson, by the attorneys for the defendants, by the city attorney and by Mr. J. M. Head, of the Warren Brothers Company, amounted to an acknowledgment that there was nothing but bluff in the Warren contention and that this time their bluff had failed to work.

By reason of the unjust patents the people are compelled to pay from $2.00 per square yard up to prices too ridiculously high to mention, for tar macadam mixed and laid as bitulithic, whereas $1.25 per square yard would, in most cases, be a good price. The truth of this is proven by the city of Nashville, Tenn., which lays its own bitulithic pavements under a contract with Warren Brothers Company, of Boston, they paying a royalty of twenty-five cents per square yard; including this royalty the city of Nashville is able to construct its bitulithic pavements at a total cost of about $1.25 per square yard, as I am informed and believe.

As I stated before I have no fight to make aaginst bitulithic pavements; they are good pavements when well built and will stand the test of time, but my city did object to being held up by what we conceived to be an un-

just monopoly working under patents which we did not believe would hold water. So, I set about long ago to try to find if there were not some way out. I knew of the Denver pavements and of the Washington tar macadam, and my investigation led me to the pavements laid by Booth and Flynn in Pittsburg and to others.

In consequence of this investigation we have adopted specifications which will admit bitulithic, which are in keeping with Mr. Kirschbraun's analyses of the Denver and Pittsburg asphaltic concrete pavements, and the decrees in the Creston and Topeka suits, along with and on an even footing with bitulithic and other similar pavements.

There can be no question of the comparative merit of the pavements under consideration; certainly the demonstrations made at Denver and Pittsburg prove the merit of those paving mixtures; they are eight and ten years older even than the oldest bitulithic pavement in existence.

I want it to be understood that I am favorable to the paving mixture known as asphaltic concrete or bitulithic; that is to say, a mixture of crushed stone, sand and asphalt or coal tar, heated and mixed together in proportions that produce a solid or concrete mass, and from my observation I believe the mineral aggregate composed of stone that will pass a ½-inch mesh is better than where larger stone is used. In all cases where I have examined the old pavements composed of larger stone I find that the large stones fracture under traffic and start the pavement to ravel or wear away.

My desire in this matter is to point out the way by which we can get the benefit of the best demonstrations that have been made in bituminous concrete without paying a royalty to any concern.

Reply by George C. Warren

I VERY much regret that I did not have a copy of Mr. Kingsley's paper in order that I might more intelligently and accurately discuss the contents.

In the first place the paper refers to asphaltic concrete pavements, the wearing surfaces of which are not asphaltic concrete at all, a fact which proves the looseness of the application of terms in speaking of pavements. "Asphaltic concrete" is used to mean almost anything. The term "asphaltic binder" is used to mean either pure bitumen which is poured onto the stone, mixed with the stone in pavement construction, or the bitumen-coated stone used as an intermediate course between the foundation and wearing surface of the standard asphalt pavement, totally different applications of the same term.

The burden of the paper I may fairly say refers to Pittsburg and Denver.

First as to Pittsburg, I happen to have here photographic copies of the contract referred to in the city of Pittsburg. This particular one is Fifth avenue, one of the pavements referred to by Mr. Kingsley. That pavement is not called "asphaltic concrete." It is not asphaltic concrete, but it called an "asphalt pavement." The cement used was called vulcanite, being a mixture of Trinidad asphalt and coal-tar pitch. Before this time and right up to the time of development of bitulithic pavement, there was universally used what is now called the "open binder," that is, a uniform sized stone, generally specified as all passing one inch, sometimes one and a half inch screen, using nothing which will pass a quarter or one-half inch screen.

The object of that open binder was to overcome the slipping of the asphalt on the foundation. It was essential from that point of view the the bituminous binder be open and as rough as possible. To produce the stone it was necessary to screen out the fine particles below a quarter of an inch. It was a very common thing to turn the small screenings into the sand mixture, as it would otherwise be waste.

Messrs. Booth & Flynn laid the pavements under these specifications, which call for a pavement laid in three courses: First, crushed stone poured with "vulcanized cement," as it is termed; second, an open binder course, all particles of which these specifications say shall be coarser than one-quarter inch. The asphalt wearing surface was made of sand with a small proportion of crushed screenings, which the specifications state not to be coarser than one-fourth inch. That, I say, is not in any sense "asphaltic concrete." I am very sorry I did not know that this question was coming up, as I could have had some samples from a portion of that street where

the original construction is still in existence, showing the surface, which is simply a sand mixture with a little one-quarter inch stone and a sawed section of which looks like a very lean fruit cake, with occasional currants one-half inch or more apart. (A sample of the pavement was shown later appearing as described.) That is not concrete. There are portions of this pavement which are today in existence in which the asphaltic sand surface, or more properly termed asphaltic mortar surface, was laid very soft, in fact so soft as to have been almost impassable when laid, and portions of the surface have been pressed into the binder to a certain depth; and where the asphaltic surface is entirely gone today you have an appearance of the thirds of the surface patched with asphalt pavement. If the old surface was satisfactory, why patch with asphalt and sand, without any stone?

Here is another photograph looking down on the surface of one of these pavements, on a portion where the asphaltic mortar surface is not entirely worn off. On the surface is a 10-cent piece, which will show relatively the size of the few particles of fine stone in the surface. So much, gentlemen, for the so-called Pittsburg asphaltic concrete pavement. I have no quarrel with the Pittsburg pavements, if they are classed where they belong.

The next point is that referring to Denver. When the pavement was first presented to this body and every other

FIFTH AVENUE, PITTSBURG, PA.

asphaltic concrete pavement. It was not asphaltic concrete pavement when it was laid, and I am sure no one would accept such a pavement to-day. Perhaps the strongest evidence which could be given of the fact that these pavements were not satisfactory is that they have not laid a yard in the last fifteen years. Perhaps the strongest testimony we could present here without having affidavits or sworn testimony, is the fact that the city of Pittsburg does not recognize these pavements as an anticipation of the Warren patents, and that they have executed a license with the Warren Brothers, under which the city of Pittsburg will in the future lay bitulithic pavements with its municipal plants.

Here is a photograph of one of the streets, which shows an absolute absence of traffic, and yet it shows two-

engineering society in this country, no hint was made that it was not a novel pavement. There has not been a square yard of pavement in the city of Denver, laid during the period which Mr. Kingsley referred to, in which the wearing surface was made from crushed stone or gravel. Mr. Blake laid some alleys in the city of Denver with a mixture of asphalt and gravel just as it came from the gravel bank, as a foundation, and on top of that surface a standard asphaltic sand mixture two inches in thickness. That is the Denver pavement, and if I had known this matter was coming up, I would have had samples and affidavits to prove it.

In regard to the Topeka litigation, the Denver pavements were no anticipation, were absolutely different pavements, and the contractor, having made a contract to lay a pavement in

Topeka which would be a clear infringement, comes before the court and says, "I have permission from the city to change the specifications, so as to lay a different pavement, one which contains only 10 per cent. of stone coarser than one-fourth inch, and all of which will pass a one-half-inch screen." This amended form of pavement is not an infringement, neither is it asphaltic concrete, and is approximately a duplication of the Pittsburg pavement referred to. If such a pavement is satisfactory to municipalities, I have no objection to its use, but such a pavement should be termed as it is, an asphalt pavement or asphaltic mortar pavement, not asphaltic concrete.

Mr. Kingsley refers to a similar case at Creston, and the pavement as laid was an asphaltic pavement, specifications stating that not to exceed 10 per cent. of it was to remain on a quarter-inch screen and not exceeding 20 per cent. of it was to remain on a No. 10 screen. The surface, therefore, is not exceeding 20 per cent. coarser than 10-mesh sand.

Concrete, whether with asphaltic or hydraulic cement, means a material of coarse and fine aggregates, the coarse particles of which predominate. If the fine particles predominate, you have the conditions similar to the occasional currant in a loaf of cake.

Mr. Kingsley referred to the five years' litigation we had with the city of Owosso, defended by the largest asphalt company in the world. They showed a sidewalk at Long Island City and a concrete reservoir lining. They knew about the Denver, the Washington and the Pittsburg pavements; no one knew them better. Consequently evidence of these pavements was not presented to the court.

Referring to the city of Washington, it has been stated that pavements have been laid which anticipate the Warren patents, but again there is a confusion. The early specifications in the city of Washington, as also clearly shown by the small bits of original surface still remaining, like the early pavements of the city of Pittsburg, distinctly described pavements laid in three or more layers, the bottom layer being of stone about three to four inches in size and intermediate binder course of one inch size, with wearing surface about two inches in depth, of mixtures of sand and coal-tar bitumen. To-day there are patches in the center of the street (most of the pavement having long since been resurfaced) where the wearing surface, which was originally laid very soft, has been worn away, but portions of it pressed into the binder course, the now exposed surface having an appearance of bituminous concrete, which it was not when laid, as is clearly proven, not only by the specifications of the contract and other evidence, but by the present condition of the surface next to the curbstones and other places which have not been exposed to traffic, where the original bituminous sand mixture surface is still found.

SURFACE OF ASPHALT STREET, PITTSBURG, PA.

Pavements of Erie, Pa.*

By Faulkner G. Lynch, Deputy Engineer in Charge of Paving Construction

IN considering the pavements of the city of Erie, we find a number of different kinds, although not of such a great variety as have been used in some other cities of this country.

Pavements have been laid of wood blocks, stone blocks, cobblestone, macadam, block and sheet asphalt. Much has been learned by experience with these different varieties of pavements, and at the present time, having profited by the experience of the past, the experience of other cities, and the advice of some of the best authorities, a standard of construction and specifications have been produced for the building of the more modern of these pavements, which we believe have produced excellent results, and after some years of wear, show for themselves a great superiority over work of the past.

As we know, the method of procedure preliminary to the laying of a street pavement differs in different states. In some places commissions are appointed which control the letting of contracts, select the material, appoint engineers and inspectors, and take entire control of the work. This is not the case in this city, which is under the laws of Pennsylvania governing third-class cities.

When the time has arrived at which it is thought to be a necessity to pave a certain street, an ordinance is passed in the councils providing for the grading, curbing and paving of that street, stating that the city engineer shall advertise in at least two newspapers published in the city of Erie, for one week, for proposals for the construction of the improvement, and shall draw up and exhibit in his office full specifications and plans for the construction of the work, and shall furnish each bidder with blank proposals, and such other information as may be necessary to enable him to submit a bid correct in form. The ordinance also contains provisions for the collection of the cost of the improvement, which is usually assessed by the foot frontage rule for the curbing, paving and draining. At the present time paving ordinances provide that the assessments shall be payable in ten equal semi-annual installments, with interest, the first due in thirty days after the completion of the work, and the balance in nine semi-annual installments, with interest at 6 per cent., or it is optional with the property owner to pay the entire assessment at once. It is the duty of the city treasurer under the terms and conditions of the ordinance to collect all installments when due. If it is impossible for him to collect the installments, he is to deliver to the city solicitor a certified copy of all unpaid assessments, at the expiration of four months, for the purpose of filing liens. For the purpose of paying the contractor the ordinance provides that the mayor shall issue street improvement bonds, to be denominated "Erie City Street Improvement Bonds," under the seal of the city and in the sum of $500 or fractions thereof, bearing interest at 6 per cent. and payable by the city treasurer. The contractor may take either the bonds or cash, or may, at his option, take an assignment of the assessments against the property, but the contractor must designate in the contract to be signed by him whether he elects to take bonds or assignment of the assessments in payment of the cost of the work. The ordinance also makes an appropriation to cover the entire cost of the work, stating the portion assessable to private property and that assessable to the city, which consists of the intersections and alleys, church, school and city lots fronting upon the improvement.

It may be of interest to know in what manner assessments against the different properties are computed. There are two methods of assessment authorized by the state law, one being the assessment by the foot frontage rule, and the other by viewers, both being in use in this city. An assessment by the foot frontage rule covers the entire cost of the work, including inspection and cost of analysis and testing of materials as carried on from day to day by the department of engineering, this total cost, after deducting the cost by the yard for alleys and street intersections, being divided by the total feet front of property abutting upon both sides of the improvement. The assessment by viewers is somewhat similar, the cost per foot front being figured in the same manner by the department of engineering, but submitted to a board of viewers appointed by the judge of the county courts. It is the duty of the board of viewers to adjust and fix the benefits or damages against the different

*A paper before the American Society of Municipal Improvement.

properties in a just and equitable manner, an illustration of this adjustment being the assessment against a triangular shaped lot. By the strict frontage rule, assessment would be made upon the entire side extending to the outermost point of the triangle abutting upon the street, whereas in an assessment by viewers perhaps a fair proportion of the valueless point of the triangle would not be considered as assessable, and the city would be required to pay for that portion. There are other features of this method of assessment which make it valuable in the paving of streets of irregular width and shape, particularly if some portions be occupied by street car tracks or railroads. The total costs of all improvements are compiled in an itemized and tabulated form in the department of engineering, and certified to by the city engineer before an assessment is made.

In considering the condition of the different kinds of pavements on the streets of this city, we find them in fairly good condition, owing to an effective system of making repairs by the department of engineering with funds appropriated for that purpose. While the city has not yet succeeded in obtaining a municipal asphalt plant, the time is not far distant when it will make its own repairs to asphalt, as it is now doing to other pavements, and undoubtedly at a great reduction in cost, the necessary land for the location for such a plant having already been acquired. The saving of expense for repairs to asphalt pavements will grow greater as time goes on and the guarantee periods expire on the various pavements, which must then be maintained at the expense of the city.

In this city a thorough system of inspection, both of material and actual construction of the work is now in force and has been so for the past three years. Examinations are held from time to time of applicants for the positions of both sewer and paving inspectors. This examination consists of questions bearing directly upon the methods of construction and quality of materials to be used in the work. After this examination by a board appointed by councils, consisting of the city engineer and plumbing inspector, and from those men who show a clear understanding of the work the mayor appoints six ward inspectors, and the city engineer appoints as many paving inspectors as are required. All give bonds in the sum of $2,000. The time has arrived in this city when a mere ward politician, who has, or thinks he has, political influence, cannot superintend public work unless he is thoroughly capable, and it is an undisputed fact that much poor work done in the past can be directly traced to the fact that inspectors with no knowledge of the work have attempted to superintend the construction of pavements and sewers in this city.

After the line and grade stakes on a pavement have been set by the engineer in charge of paving construction, the chief inspector, a man experienced in every branch of asphalt paving work, who is also appointed by the city engineer at an annual salary, inspects the progress of the work, the mixing of asphalts at the various plants, and superintends the inspectors on the different jobs. He secures samples of the mixtures daily for analysis at the office, where the engineer in charge of paving construction tests all the different materials used in the work, asphalt mixtures, oils, cements, brick, sand, and gravel, and keeps a complete record of all such tests.

The city is now in possession of a sufficiently complete testing laboratory for such purposes, resulting in a great saving in expense for the testing of materials, as the actual cost of making the tests in the city laboratory is very small. We have in the exhibit room in this building samples of asphalt surface laid on streets of this city at a time prior to the establishment of a satisfactory system of tests and inspection, also samples cut from streets laid under proper inspection, where the materials have been analyzed and tested from day to day during the progress of the work. I may say that the comparison is quite interesting. Not only has great improvement been made in the quality of materials, but also in the construction of street pavements, some features worth mentioning being the rolling of the sub-grade with the city's ten-ton roller, for which the contractor pays the city one cent per square yard of surface rolled. Concrete of the prescribed thickness is now required not to exceed a given area of surface per barrel of cement used, also cement curb must not overrun a given measurement per barrel of cement used. Steel T-bars, bent to 5 or 8-foot radius, as the case may require, are used to reinforce the curved pieces of curb in street intersections. Brick gutters are now used on all asphalt streets and are usually laid 3 feet in width. Particular attention is paid to crown of surface of pavements, which varies in proportion to the grades adopted. Some newly paved streets, 100 feet in width, have been paved with double

driveways, each 20 feet wide, with 16-foot parkways extending through the center. These, when planted with shade trees and seeded in grassy lawns, improve and beautify the street and increase the value of real estate along these boulevards. Asphalt pavements which require a certain thickness of surface and binder under their respective contracts may be relied upon to be of the correct thickness when laid under this system of inspection. Erie being situated upon the shores of Lake Erie, is in a favorable location for securing the best of lake sands, which enter into the composition of our asphalt pavements, and require but very little grading to produce first-class mixtures. The percentage of bitumen required to produce the best mixtures with these sands may be slightly less than that required by some bank sands, and it has been determined by analysis that from 10.5 to 10.9 per cent. pure bitumen, with filler of limestone dust of 7 per cent. in Trinidad asphalt top mixtures, with penetration of 60 for the asphaltic cement, produces good results; for Bermudez and California asphalt top mixtures, with penetration of 55, 10.5 per cent. of filler is required. These proportions produce mixtures which are neither too hard nor too soft, and a wearing surface which has given complete satisfaction.

It is a well-known fact that competition reduces prices, and this is found to be the case in the building of street pavements in Erie. In the early days of asphalt paving, about 1890, Erie paid from $2.65 to $2.90 per yard for complete pavement of surface, binder, and 6-inch concrete base, with natural cement and bank gravel. These prices have been steadily reduced until the bottom was reached some five years ago, at $1.24 per yard. At the present time the city is paying an average of $1.50 per square yard for asphalt, exclusive of curb, on a 5-inch base of Portland cement, lake sand and washed gravel concrete, and about the same price for brick pavements. In consideration of the fact that assessments are payable in ten semi-annual installments, it has been found that the sentiment against the laying of pavements has almost entirely disappeared in this city, which can boast of more and better pavements than most cities of its size.

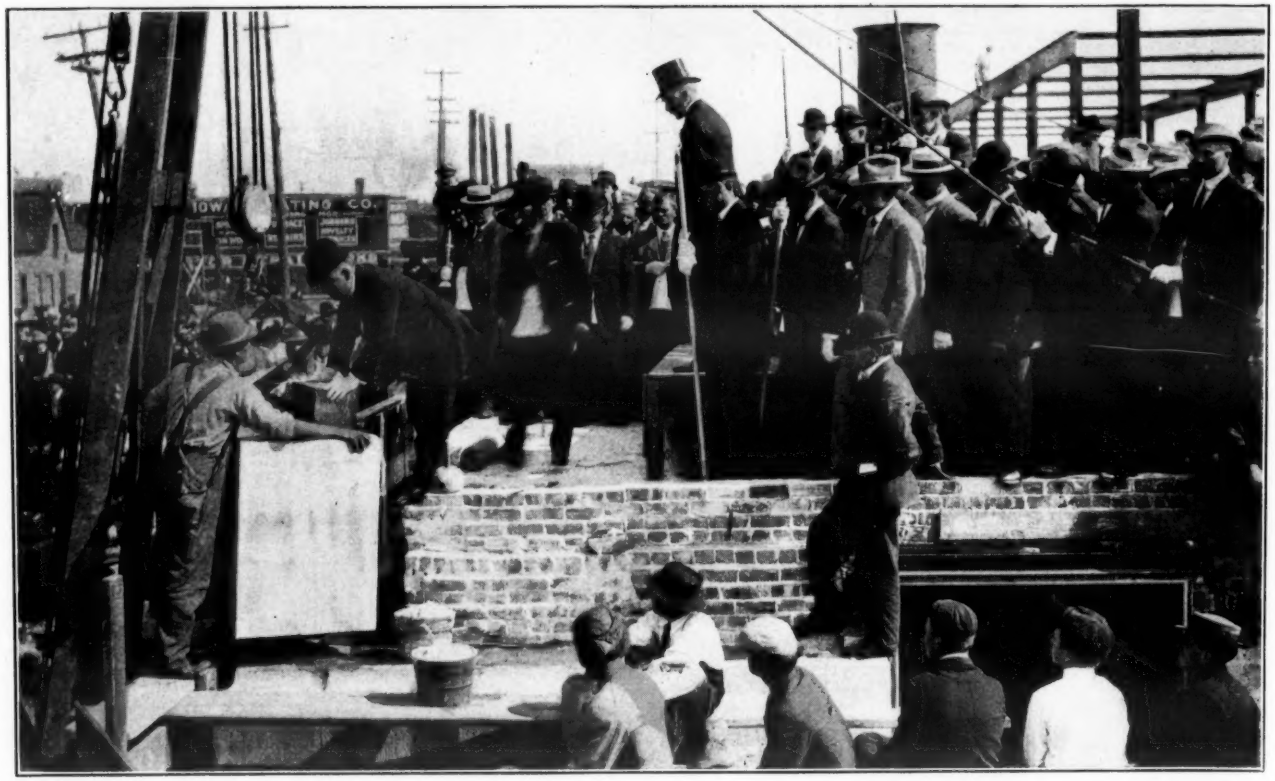
Des Moines Public Buildings

THE city of Des Moines has now been more than two years under the so-called commission form of government, and the second report of the city auditor, made under the direction of the superintendent of the department of accounts and finance, has recently been issued. It is mainly devoted to statistical tables, mostly financial, but is preceded by a brief historical sketch of the principal recorded events in the growth of the city, and by the full statute under which the present administration is acting.

The accompanying photographs, for which we are indebted to J. W. Hawke, city auditor, and Chas. W. Schramm, the superintendent of the department of accounts and finance, show some of the public buildings in the city. The first shows the laying of the cornerstone of the new municipal building, on June 14, 1910. This is the first building erected for the municipal business of a city governed by a commission, and is located on the river front, in conformity with a well-considered plan for a civic center, boulevards and parks for the enhancement of the beauty of the city. When completed its appearance will be as shown in the second photograph. The third photograph shows the large room in the middle of the second floor, which will be used for a counting room for all the departments of the city government. The success of this plan can only be shown by actual test, and the results will be awaited with interest.

The fourth photograph shows the eastern entrance of the Polk County Court House, one of the other prominent buildings in the civic center plan. Its location with respect to the new municipal building can be seen in the second photograph, the tower of the court house showing at the extreme right.

Des Moines is one of the cities having a system of ornamental lighting, and the fifth photograph shows Walnut street at night, illuminated by tungsten electroliers. It must now contest the title of the "best lighted street in the United States," once given it by the *Electrical World*, with several streets and groups of streets in other cities which have recently installed more or less extended systems of ornamental lighting in their principal business streets.



I. LAYING CORNER STONE OF NEW MUNICIPAL BUILDING, DES MOINES, IOWA.

Supervision of Municipal Work*

By Will P. Blair, Indianapolis, Ind.

THERE are many questions with which we come in close contact, or with which we actually must deal, that are mooted or about which we disagree with reason or plausible excuse, but under a wide range of experience and observation there comes to us much that is so utterly inconsistent with human reason or intelligent purpose, that, from our viewpoint, at least, it is utterly inexcusable. Common with all, municipal matters come within these limits. Try as we will, to those of us whose business brings us into contact with, or to those who are making special study of various municipal problems, it would seem that they bear a burden of undue proportion of evils unreconciled within the bounds of reason. So many things are so inexplicably inexcusable that we sometimes want to characterize them softly because we are ashamed to speak the naked truth. But how can we hope to correct abuses unless we hold them up to view with all the daylight of truth, with severest search and utmost scrutiny? The very name of this society suggests that its purpose is to strive for progress and advancement in municipal concerns. Fault and dereliction should be replaced with corrected measures and integrity of purpose.

How shall we make competent and honest but by pointing out the awful examples—the inefficient and the unreliable? The public welfare does not suffer altogether from a single agency or from several agencies. The public is frequently neglectful in some—perhaps many—ways of her own interests. Stupidity and carelessness on the part of the public is no less to be condemned than when found in the individual. But the sentiment that the public deserves all she gets, and possibly more, simply because we naturally expect that some one is on hand at all times in this country, stirring the public to alertness and watchfulness—oftentimes in the directions even from which comes no alarm—is the excuse of the petty grafter and is unworthy of a trusted public official or employe. If there is to be a distinction in the honesty of dealings, let them be more honest when dealing with the public. The public is practically helpless in our hands, and for this reason alone should command our most honorable service.

Very recently, in a city of less than 75,000 inhabitants, a street was to be improved, in fact was being improved, of which the wearing surface was vitrified brick. A 10-inch concrete base, 1½-inch sand cushion and 5-inch vitrified block, cement filled, were the features of the specification.

What possible reason could be advanced for the use of a 10-inch concrete base?

Why the 5-inch block in such a city?

Why the 10-inch concrete base?

We are not, however, calling in question such a specification because there is any lack of merit. In these two particulars the specification was simply overdone; but we do question the extraordinary expenditure enforced by this specification in view of what followed in the application of the cement filler.

A member of the board of public works was found upon the street supervising the construction. He permitted the expansion cushion to be poured in prior to the application of the cement filler. This hot liquid ran back into the joints more than three bricks length, subsiding, in many cases, one-half of the height of the brick. In the application of the cement filler it was allowed to be mixed in a box that of necessity was up-ended slowly in floating out the mixture upon the pavement. As it reached the upright position in this operation, a man, detailed for the purpose, threw a bucket of water into the box each time, so that a portion of the sand, going out of the box last, went out entirely cleaned of cement. The sand was put into a wheelbarrow and wheeled to these boxes; the proportion of sand was greater than one-half (at least an uncertain quantity), because it was not measured. A sack of cement was then put into the box and the same only stirred three times over with the hoe. In no instance was it brought to an even shade by the mixing process. The water thrown into the box while in its upright position only assisted in washing the cement to the gutter, so that in the gutter and into the place for the expansion cushion went the mixture of almost pure cement, while

*A paper before the American Society of Municipal Improvement.

II. PERSPECTIVE OF NEW MUNICIPAL BUILDING, DES MOINES, IOWA.

the crown of the street was filled with a mixture not richer than four parts of sand to one of cement; in certain parts not even so rich as this, and owing to the large quantity of the mixture deposited on the street at one time, and the water flowing promptly to the gutter before it could be swept in, it left the mixture thick enough to bridge the interstices, so that many of them were not filled at all. The use of the squeegee at angles of 45 degrees seems not to have been suggested at all to prevent hollowing out the interstices.

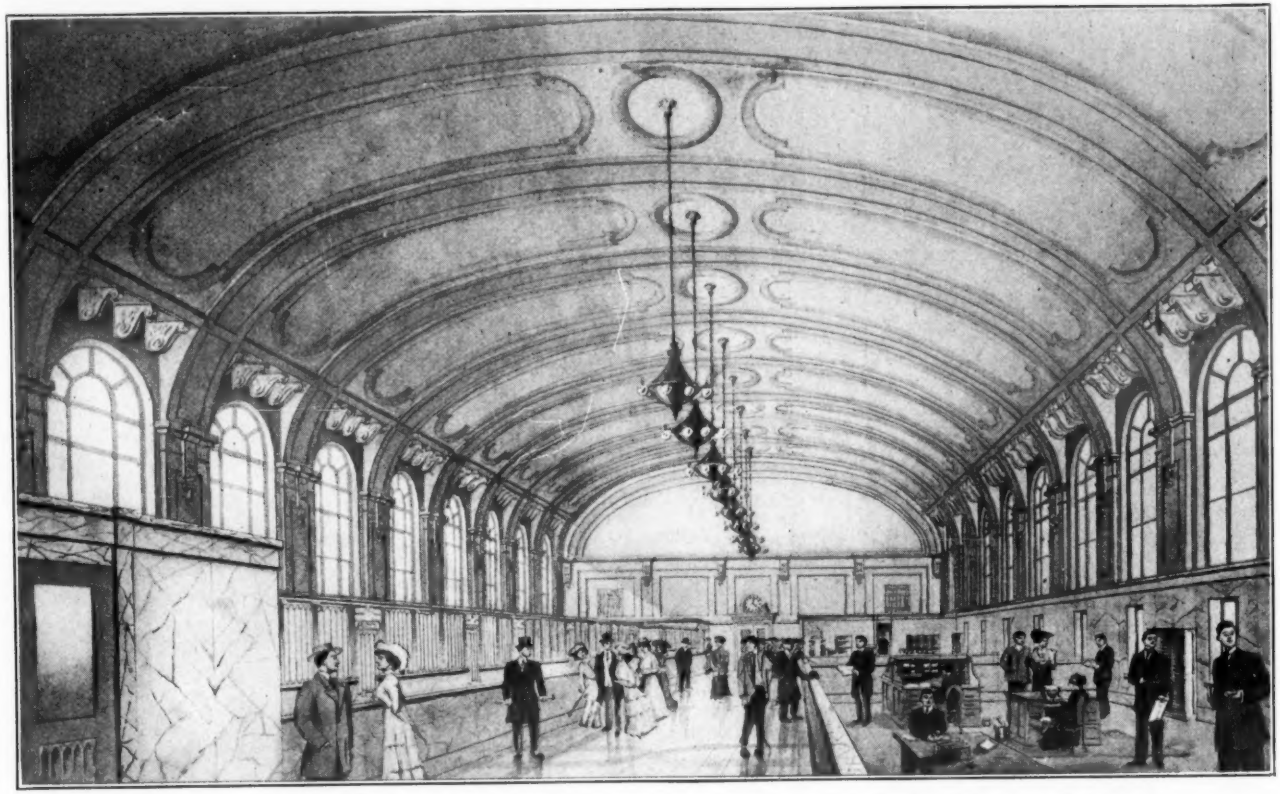
Even a member of the board of public works contended that the application of the expansion cushion as mentioned was required by the specifications under which the street was being built, but an examination of the specifications showed them to be correct and the board member wrong. From the ignorant manner of putting in the filler the disastrous results could readily be observed, even while the work was going on. But the incongruity of the affair, such lavish expenditure of the taxpayer's money on the one hand and such woeful ignorance on the other—yet all this in a vigorous American city of unusual thrift and intelligence. The condition of that street even one year hence is perfectly apparent through this operation, the cement bond having already broken on a portion of the finished street. In less than one year the whole street will be in a far worse condition than it should be at the end of twenty years' use.

Contrast, if you please, the condition of this work with that of the five-year-old finished street, Jennings avenue, Cleveland, O. Though utilized by two street car tracks, its beauty, utility and satisfaction as a city street and the extraordinary care and skill with which it was constructed are scarcely possible of description. Its very sight is inspiring. You can cross and recross the street without any knowledge of the car tracks, if you but close your eyes. Not a single wave, depression, jolt or jar discernible, either to the eye or by use of the street. The foundation is but 6 inches and the brick are but 4 inches in depth, and, although the traffic is four or five times that of the street just mentioned, its five years in use have in no wise reduced its worth. It bears every evidence and every promise of 100 cents on the dollar in value at the end of ten or fifteen years in use. If it were possible to afford a critical examination of that street on your part at this time, I do not think you would call me extravagant if I would say twenty-five years in use would not depreciate its value sufficient to call for repairs. In the one case may be found a sacrifice of $65,000 upon the altar of ill-considered plans and unskillful and ignorant execution. In the other, the investment of a like amount is maintained at full worth and answering its purpose completely.

In one of our larger cities another brick street was in construction. In this case the specifications were right. The concrete foundation was put in in fairly good condition, but should have been much smoother. The sand cushion was not compressed and was much intermixed with sticks, wood and broken stone. The brick were dropped into the street regardless of best edge up. The provision for expansion was a board 5 feet in length, 3½ inches in width and ⅜ of an inch in thickness. The board was taken out and the expansion cushion even poured before the rolling of the brick, preceded, however, by the filling of gravel in the crevices at least one-half way up the brick, to prevent the roller from closing the opening entirely. The rolling began at the crown instead of the gutter. A husky, muscular fellow was delivering the portion of sand in a wheelbarrow, while a physically weak and decrepit one was delivering the cement. The proportions corresponded to the individuals doing the work. This mixture of sand and cement was made upon the sidewalk, shoveled dry upon the street, shot at with the hose. Most of the cement went into the sewer. This was overseen by an inspector in constant service for the city, supervised by an engineer, but all characterized and dominated by an ignorant contractor, in constant complaint with the citizens and officials to the effect "that it was impossible for him to make a good street, being compelled to use brick that were for the most part culls;" yet in truth and in fact I have never seen a better delivery of brick anywhere.

The engineer was not the commander, but the menial, so servile that his suggestions were met with virulent abuse from the contractor—yet this job involved an expenditure of not less than $100,000.

Suppose you, under circumstances of this sort, that satisfaction could be guaranteed, and that the money was not thrown away? But the tension and irritation of this experience was greatly relieved by another experience, but not in the same city, yet where a like contract was being executed. At its very inception the engineer, deputies



III. COUNTING ROOM FOR ALL DEPARTMENTS IN NEW MUNICIPAL BUILDING, DES MOINES, IOWA.

and inspectors were upon the ground. Intelligence and sound judgment were exercised in every detail, and, though the contractor stormed and fumed, he soon realized that he was bound, hand and foot, to the specification as it read. Neither argument, abuse nor irony affected in the least bit the attitude of the engineer. The contractor, in less than one hour, reversed his disposition and skillful results followed, yet no more and no less was expected or required of this contractor than that which was written in the specification. The cost of the improvement was about the same in the aggregate as the one mentioned preceding, but the taxpayer got value received, dollar for dollar.

A picture of future results is fully and fairly illustrated by what was observed by the committee on brick paving from this society in a little trip taken by them in July, in the condition of Linn street, Cincinnati, and that of Holmden avenue, Cleveland. Each about the same length of time in use, of similar brick and similar use, but what a difference by contrast in the present condition! Measured by money value, a difference of about 90 per cent., but that difference as found to-day was simply the difference that might have been observed at the time the two streets, respectively, were built.

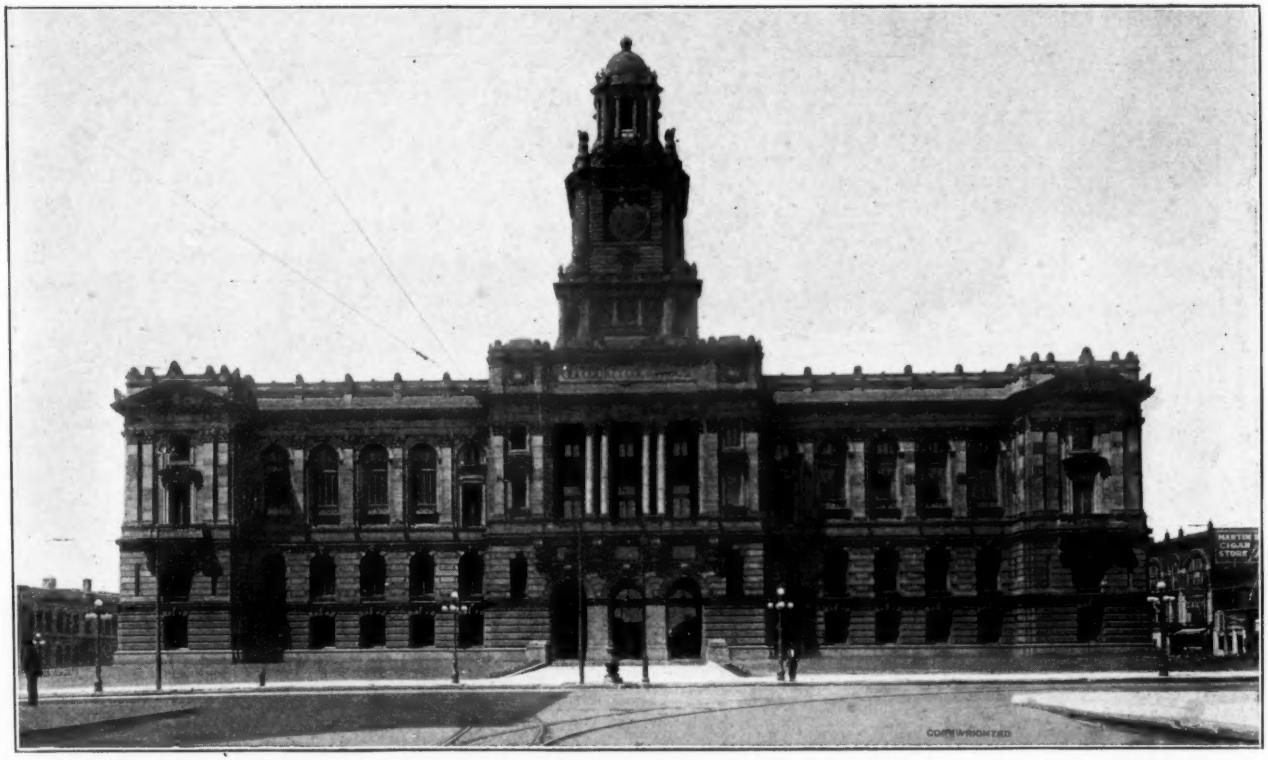
These observations, gathered fresh from the field within the past few weeks, seem extreme, but they fairly represent the ebb and flow of the tide in character and practice of municipal work, and, while these illustrations involve only brick street construction, such conditions are not confined to brick street construction alone, but permeate all branches of municipal work, and to an extent that is absolutely alarming and afford a black spot upon municipal government in this country.

Is it not, therefore, the duty of every patriotic citizen to change this state of affairs? Is it not the duty likewise of every engineer to eliminate from his profession everything that attaches to, confronts, hinders or delays the exercise of professional duties in the most advantageous way for the benefit of the public welfare? How may this be done? We may be sure it never will be done by efforts outside the profession. It may be inaugurated, insisted on, even demanded, on the part of and by the profession itself, for professional practice does not end with plans; it terminates only with execution. Cooperation and sympathy on the part of the public must be obtained in order that our own efforts shall be effective to the end sought. A remedy for these conditions must be sought for personally, individually, by the engineering profession and by the combined influence of just such organized force as that of the American Society of Municipal Improvements. In fact, it is right and proper that this society shall go down in history as the one society taking the lead in this matter, for here we have the combined influences of professional engineers, of municipal officials, and those whose business it is to serve the public through them.

I wonder if the lights of the General Electric Company would at this time have been developed to that world-wide extent if the manager had sat in his chair, and taken on, as assistants to his leading engineers, help based on recommendations of personal quality alone. Rather, have they not succeeded by seeking out almost entirely a class of thoroughly trained collegiate engineers, who could readily grasp every detail of their work, and thus be able to soon acquire efficiency in their service? The engineer in such an institution may be heard attentively by the hour, in the urgency of his suggestions toward perfection and the adoption of detail, which has contributed so greatly to the success of our commercial enterprises. In municipal matters, more in the past than in the present, "Mike" or "John" or "Jim" was chosen to assist the engineer because of his acquaintance and political influence in his ward, and this, and this alone, is his recommendation.

"You must get along as best you can with the men we furnish," comes the order from higher up to the municipal engineer. "The ordinance of the council prevents my writing the specification as it should be written; my hands are tied; McDougal & Flannagan must have this contract."

These are the hindrances to the reforms suggested and these are the hindrances that must be removed, and these are the hindrances that will only be removed upon demand by the engineering profession of America. When shall this be done? I say now! The sear is being rubbed off the public conscience, and it is now in better condition to receive the medicinal dose than at any time heretofore. You who are simply city officials join hands with the engineers in a resolution from this body that shall reach to the core of the evil.



IV. POLK COUNTY COURT HOUSE, DES MOINES, IOWA.

The Economics of Modern Highway Engineering*

By Prof. Arthur H. Blanchard, Consulting Highway Engineer, Brown University, Providence, R. I.

THIS discussion of the economics of modern highway engineering will be restricted to the consideration of the general situation relative to the economical use of the various methods employed in the construction and maintenance of roads and streets subjected to modern traffic.

One of the most important problems confronting every highway engineer today is the determination of the most economical and efficacious methods of construction and maintenance to be employed on the various roads and streets for which he is responsible.

The rapid increase in the rate of adoption of the motor vehicle, both passenger and commercial, has materially complicated the problem in many instances. Unfortunately, some of the basic principles of economical highway design have been forgotten or at least neglected in the strenuous endeavor to abate the dust nuisance and construct a surface which would not be disintegrated by either horse-drawn vehicle traffic or motor car traffic.

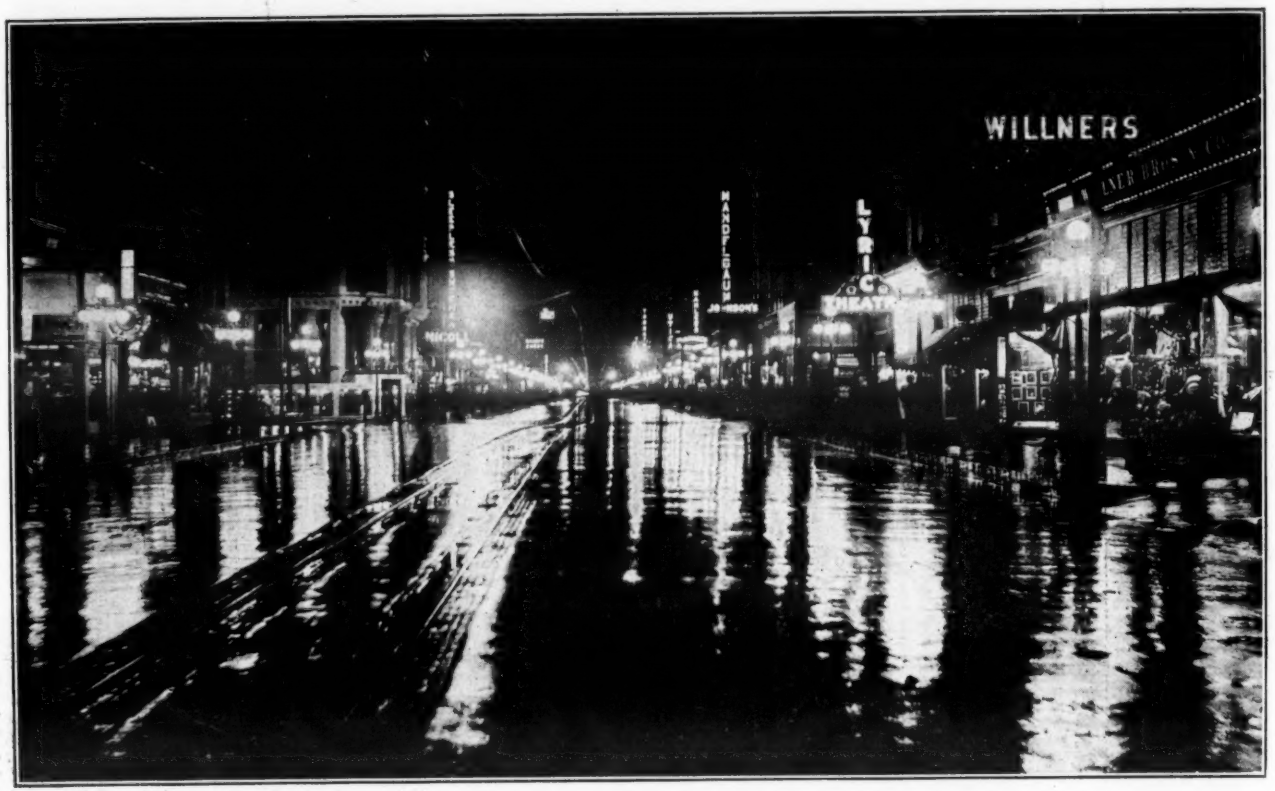
That the economical solution of the problems is rendered difficult by the lack of sufficient scientific data based on practical experience is self-evident. Nevertheless, present practice is susceptible of marked improvement, as there are to a certain extent limiting conditions governing the use of practically all of the various types of surfaces and pavements. By those conversant with the practice throughout the United States in the use of bituminous materials and the various dust palliatives in the construction and maintenance of roads and streets which have received attention because of the disintegration of the surface by motor car traffic or from the standpoint of dust prevention, it will be readily admitted that the employment of the method and material economically adaptable to local conditions is the exception rather than the rule.

If the conception of any engineering problem is not based upon the fundamental principles of the science pertaining thereto, and if all the multiple interdependent variable factors are not given due consideration, its successful solution is practically an impossibility.

Before citing several instances of uneconomical and economical solutions, it seems necessary, in order to avoid a misunderstanding of technical terms, to define two phrases which will be employed in this discussion. The term bituminous pavement will be used to designate a road having the upper course constructed by either the mixing or penetration method in which a bituminous binder is employed, while the phrase bituminous surface will be used to imply a thin bituminous coating or film on the surface of a road or pavement. Superficial tarring, the application of tarred sand or tarred chips and the use of all kinds of asphaltic coatings will come under this designation.

As the first illustration will be cited the case of the adoption of a bituminous pavement which would cost 40 cents per square yard over and above the cost of ordinary macadam for a street which could have been economically maintained, if properly built of ordinary macadam, and treated annually with a light application of either an asphaltic or a tar compound. The first application might cost from 4 to 6 cents per square yard, while the annual application and repairs thereafter would amount to a yearly charge of from 3 to 4 cents per square yard. Until it is fully demonstrated that the type of bituminous pavement mention above has a life of more than ten years under the conditions noted, and that the annual average maintenance charge will not be greater than one cent per square yard, the advisability of selecting ordinary macadam with a bituminous coating is not debatable from the standpoint of economical maintenance. If, however, it had been possible to construct a bituminous pavement at an excess cost of 12 cents, as the writer was able to do as late as 1908, while deputy engineer of the Rhode Island State Board of Public Roads, it would have been self-evident that this type of construction would have been preferable from the standpoint of economics, provided that the pavement had a life of five years, which a recent examination indicates as a conservative estimate. Engineers interested in the economical relationship between a pavement and ordinary macadam will find an able treatment of the subject under the heading, "Comparison du Pavage et de l'Em-

*A paper before the American Society of Municipal Improvement.



V. ORNAMENTAL AND BUSINESS LIGHTING ON WALNUT STREET, DES MOINES, IOWA.

pierrement au Point de Vue du Prix de Revient Annuel," by M. H. Heude, inspector-general of the Department of Roads and Bridges of France. The above paper was published in the Annales des Ponts et Chaussees for 1908.

The indiscriminate advocacy of bituminous pavements for all classes of roads and for many classes of city streets which are subjected to motor car traffic is as unsound as the contention of some engineers that the periodical application of light oil to the surface of a macadam road is a satisfactory and economical prescription for the preservation of the surface and the alleviation of the dust nuisance, irrespective of the location of the highway and the amount and character of the traffic to which it is subjected. Between the above limits are found many conflicting opinions which will not bear the searchlight of the investigator.

What are the reasons for the present situation in many localities in the United States? Why is not the practice of some of the leading municipal and county engineers of England duplicated in every state, county and city throughout this country? The writer has in mind one county adjacent to London whose engineer, after considering the design of a given section of highway with the same care and deliberation which characterizes the work of American engineers when designing a mile of railroad or a bridge, is able to determine within reasonable limits whether it is economically advisable to use a wood block pavement, a bituminous pavement constructed by the mixing method, a bituminous pavement constructed by the penetration method, an ordinary macadam road with a bituminous surface, or merely an ordinary macadam road. As a result, all the various types of roads and pavements mentioned above are found on the main trunk lines in this county, each used under conditions where it is economically adaptable in view of the present knowledge relative to limiting conditions. An investigation of current highway engineering practice throughout the United States will reveal the following characteristics, all of which are applicable to some localities, while one or more are influential in shaping existing conditions in many instances:

First—Political interference in the selection of the men placed in control of highway work and with the work of design, construction and maintenance of roads and streets.

Second—The interference by controlling bodies of laymen in the legitimate work of the highway engineer.

Third—Division of responsibility in the supervision of highway work, particularly in municipalities, but also applicable to some states, as, for instance, those in which the state department supervises the design and construction, while the responsibility for maintenance is based upon the county or town.

Fourth—The comparatively small number of well-trained highway engineers who have devoted the requisite time and energy to the many new problems which have arisen during the last decade.

Fifth—The comparatively infinitesimal amount of investigation which has been considered necessary as preliminary to the design of a road or street or a system of highways. This condition is due to a lack of appreciation of the relationship existing between the results of such investigation and the economics of construction and maintenance. Even when such relationship is recognized by the engineer, the controlling body rarely allows sufficient time or is willing to grant an adequate appropriation for a thorough study of the problem.

Sixth—The general meagerness of detail knowledge of the many different materials on the market and the varied methods in connection with which they may be used. The engineer must not confine himself to a consideration of the crude and many times expensive methods which have been in vogue, but must base his decision on the use of the most economical method of performing the work, which naturally will include an investigation of all machinery adaptable to this class of construction work and of the practicability of designing new apparatus suitable to the case under consideration. It is likewise desirable that the engineer should have a wide acquaintance with methods and materials used in both the allaying of dust and the construction of bituminous pavements and surface, which knowledge has been secured through other channels than by a perusal of the advertising literature with which the country is flooded. At the present time, when the chemical and physical analysis of bituminous materials and the effect of the various properties on the adaptability of the material for use in the construction and maintenance of roads and streets is in its infancy, it is not to be expected that the engineer will be able to draw up specifications for every case which will secure the most economical and efficacious material for the purpose, and at the same time eliminate all undesirable materi-

als, but, on the other hand, in view of the progress which has been made during 1909 and 1910, the number of mistakes should be materially reduced.

Seventh—A confusion of ideas on the part of many as to the reasons for the success or failure of various methods, considered both from the standpoint of road preservation and dust prevention. For example, a bituminous pavement built by the mixing method, with the most efficacious binder manufactured, may disintegrate within a year after construction, due to the neglect of but one item, for instance, that of preventing a layer of dust from accumulating on the surface of the bituminous coated road metal before the same is rolled. Failures of this type of pavement are usually laid to poor binding material, while in reality there are a score of reasons for unsatisfactory work of this type. It is well known that many kinds of bituminous pavements, under certain conditions, are very dusty, due to self-evident reasons. If the traffic consists largely of horse-drawn vehicles and the adjoining streets are of ordinary macadam, it is useless to expect a street protected from the action of the wind and bordered by trees and curbs to be free from dust without artificial cleaning or the application of some form of dust palliative. The dusty condition of many bituminous pavements and bituminous surfaces on our city streets has, unfortunately, led to the conclusion that bituminous pavements and surfaces are not dustless under any conditions. To those who have motored over hundreds of miles of bituminous surfaced roads which were dustless the above opinion, so commonly expressed, appears absurd. One other illustration will be mentioned. In certain cases the periodical watering of macadam surfaces has proved efficacious, both from the standpoint of laying the dust and as a road preservative. Based on the above results, some engineers have advocated ordinary watering as a universal remedy for all classes of macadam roads and streets, irrespective of the traffic to which they are subjected or a consideration of the economics of the public.

Eighth—Many authorities are seeking for a panacea for the treatment of all classes of roads and streets. It must, however, be constantly borne in mind that it is impossible to treat economically all highways by the same prescription, just as it would be considered to-day absurd to follow the former practice of some of the municipal engineers of the old European cities and pave all of the streets with stone blocks.

Ninth—Non-observance of the relationship between the adaptability of various methods and the variability in the cost of labor and materials, and the accessibility of new bituminous materials and machines.

The self-evident desirability of a thorough discussion and an exhaustive study of the economics of modern highway engineering influenced the writer to prepare this brief presentation of the status of the administration, design, construction and maintenance of roads and streets subjected to modern traffic.

Parks and Play Grounds in South Park System of Chicago*

By H. S. Richards, Assistant Superintendent

PERHAPS no civic undertaking within the last decade has been of greater value to the people than the development of the small park movement, with all that it implies in the way of more ample facilities for the health, recreation and even education of both young and old. The "public playgrounds" have become an indispensable factor in the life of today.

By the establishment of widely scattered parks and squares of moderate size, these breathing spots are gradually being brought within walking distance of the entire population. The South Park Commissioners of Chicago carefully collected all data bearing upon the subject, and made a systematic study of the problems involved. Prior to 1903, however, their hands were tied, and they could only pursue their investigations and await the day when the statutory bonds which held them should be released.

The Board of South Park Commissioners is a distinct corporation in no way related to the city or county government. The Commissioners fully realized the necessity for building a greater number of parks, large and

*A paper before the American Society of Municipal Improvement.

small, but they were prevented by law from acquiring land which did not adjoin existing parks and boulevards.

Between 1869, when the South Park district was created and the year 1903, the population of Chicago had grown from 298,977 to 1,873,880. Populous neighborhoods had sprung up at points remote from existing parks. In many of these neighborhoods, the residents were practically prohibited from enjoying the park privileges by reason of the distance of the parks and the cost of reaching them. To more than half the population of the South Park district the parks were not easily accessible. Great sections, like the Stock Yards, Calumet and Englewood districts were wholly without parks.

By an act of the Illinois legislature in 1903 the limitations were removed and the Commissioners at once entered upon their task of selecting sites for new parks, proceeding with judgment and rapidity. In writing of their work, Andrew Wright Crawford said: "The fourteen recreation centers (of the South Park district of Chicago) recently established unquestionably constitute the greatest advance in the use of parks that has been taken in any one year by any one city."

Great care was employed in the selection of sites adequate to the needs of the districts to be served. It was borne in mind that the training of citizens cannot proceed advantageously in parks so cramped that it is necessary to herd the people together like cattle. As a basis for all negotiation, the valuations of the Valuation Committee of the Chicago Real Estate Board were employed. In no case did the purchase price exceed the valuation fixed by the committee.

Armour Square, consisting of ten acres in one of the most congested districts of the south side, cost $220,000, of which $50,000 was expended for land, $94,000 for buildings and swimming pool and $76,000 for improvement and equipment. For the two and three-fourths acres of Mulberry Bend Park, New York paid $1,500,000, while Seward Park, two and five-eighths acres in expanse, cost $2,500,000.

Within a year after the power was given them, the South Park Commissioners had acquired sites for twelve new parks and squares. (All areas of ten acres or under are called squares.) Today there are nine large parks, ranging from 60 to 540 acres in area, embraced within the South Park system, and fifteen smaller parks, of 7.4 to 40 acres. Five of the new parks are still unimproved, while work is in progress on a sixth.

With the acquisition of the small park sites a new problem presented itself. Groups of buildings were to be erected. It was deemed desirable that these buildings, in order to be of the greatest value to the community, should combine architectural interest and propriety with utility. Little had been done in public works in America in the promotion of landscape architecture. The approaches to some of the best public buildings are dull. This the Commissioners realized, and they were impelled to employ the most expert skill available, with the result that the Chicago playgrounds are distinguished by a type of landscape architecture which may properly be regarded as notable in many respects.

The "field houses" have been constructed of concrete. The roofs are tiled and have a heavy overhang. Their general effect is Spanish and all details of design are harmonious throughout. Ornamentation has been used sparingly and has been made an integral part of the walls, whenever used, rather than an appendage thereto. With an eye to the future needs of a rapidly growing city, the buildings were made of generous size, anticipating the increasing demands upon these neighborhood centers. Notwithstanding the policy of the Commissioners is to provide adequately, in some cases the patronage has been so tremendous as to require remodeling and enlargement even at this early day. As a result of this experience, the building now in course of construction in Park 4—the newest park to be improved, is to be much larger than any of its predecessors.

Armour Square, named after Philip D. Armour, "philanthropist and captain of industry," and bounded by 33rd and 34th streets and Shields and Fifth avenues, may be taken as typical of the small parks. The field house contains two indoor gymnasiums, one for men and boys and the other for women and girls. The dimensions of the men's gymnasium are 32 feet 4 inches by 72 feet 5 inches. It contains 508 steel lockers, 8 shower baths and has a plunge pool 20 feet by 8 feet in area. The women's gymnasium is 34 feet 4 inches by 60 feet 5 inches in size and has 180 steel lockers, 28 dressing booths, 6 private and 8 open shower baths. The plunge pool is 19 feet 6 inches long and 9 feet wide.

There are three outdoor gymnasiums. The men's is 236 feet by 125 feet; the women's 110 feet by 120 feet and the

children's 130 feet by 80 feet. They all contain adequate modern equipment of substantial construction. The park has a running track of six laps to the mile. It also has baseball diamonds. In the field house, in addition to the gymnasiums, there is an assembly room, a club room, a reading room, a public library station, and a refectory. There is also an open air swimming pool, 50 feet by 88 feet in size, this being the smallest of the ten swimming pools under the jurisdiction of the Commissioners. The other swimming pools vary from the above dimensions, as a minimum, up to 80 by 150 feet in size with from 100 to 225 dressing booths for the swimmers.

All of the park gymnasiums and playgrounds are in charge of trained instructors, under a director of gymnastics and athletics. During the school year the gymnasiums and playgrounds are open from 3:30 p. m. until 10:00 p. m. The swimming pools are open from about June 1st to October 1st. Two days of each week are reserved for women and girls. The shower baths and plunges are in constant use. The buildings are open seven days in each week. Men, women and children make steady use of all the facilities afforded and reservations for the assembly room are made months in advance.

Among the manifold facilities offered the patrons of the parks are two golf links, one of 18 holes and one of 9 holes, with a clubhouse, lunch room and locker and shower bath rooms for both men and women. There are 24 football gridirons, 148 tennis courts, 32 baseball diamonds, 17 skating ponds with warming houses, as well as rowboat liveries and launch service wherever lagoons make such service possible. Every form of athletic competition is fostered, from wrestling and fencing to archery, roque and fly-casting. Neither expense nor pains is spared to give to the humblest patrons of the park the best equipment that modern ingenuity can solve. When the first roque court was opened, for example, weeks were spent in experimenting with various forms of cushions to improve the accuracy of the play. The courts themselves are of concrete, as level and as true as a billiard table and the most scientific contests are possible. At present experiments are being made with various forms of tennis courts. A composition of asphalt and cork is being tried, which promises to permit extremely fast play, while avoiding the hard and unyielding surface of concrete or clay courts.

During the year 1909 the citizens of Chicago and their families made use of the park facilities as follows: Swimming pools patronized by 758,149 persons; shower baths, 1,212,421; indoor gymnasiums, 302,222; outdoor gymnasiums, 1,943,228; assembly halls, 246,660; reading rooms, several of which are branches of the public library, 637,683. Casual spectators are not included in these counts. No charge whatever is made for bathing suits, soap, towels, lockers, gymnasium instruction or, in fact, for any service except refreshments and boats.

The cost of maintenance of each of the small park's recreation facilities averages $30,000 per annum, which sum includes supervision, policing, gymnasium instructors, attendants, janitors, lighting, heating, swimming pool service, repairing and painting buildings, care of grounds and incidental expense.

No concessions are sold. Every phase of the park's activities, to the smallest item, is under direct control of the Commissioners. All repairs and new construction are done by the park employees. The Commissioners maintain repair shops, laundries, an ice cream factory and a 35-acre nursery.

With each passing year the Commissioners are themselves doing a greater proportion of the new paving on the driveways of the system. The two portable asphaltic concrete machines in use last year have been increased in number to three, the third of which is of smaller capacity and designed for patching. With this battery of portable plants, approximately 300,000 yards of paving have been laid at an astonishingly low cost. The two larger machines have together turned out material for 2,700 yards of paving per day.

In conducting the activities of the parks, the Commissioners have had a higher object in view than the mere supplying of amusement to the masses. The effect upon the manhood and womanhood of the patrons of the parks has been constantly in mind. The results of park environment and influence have been definitely revealed in repeated instances. Bath tubs have have been installed in homes where they were unknown before the advent of the small parks with their shower baths, and the gymnasium discipline, under the conscientious direction of skilled instructors, has not failed to leave its impress upon the characters of countless young men and women. As a municipal investment, the Chicago small parks are already paying handsome dividends in better citizenship.

Some Modern Features of City Goverment and Legislation *

By Samuel A. Freshney, Secretary and General Manager, Board of Works, Grand Rapids, Mich.

LEGISLATION, as applied to municipalities during the past few years, has tended almost entirely toward giving to cities a larger measure of home rule. This is entirely as it should be. The people of any city are more competent to judge of what laws are best suited to their particular needs than any legislature can possibly be. This is especially true when we remember that most legislatures are very largely dominated by farmers. However, home rule has not been the only legislation enacted as applied to cities. The wave of conservation which is sweeping the country has been manifested in almost all legislatures. The result has been more strict provisions covering franchises, more rigid measures governing the acquiring of water power rights, and more stringent laws relative to bond issues and capitalization. Few states now permit the granting of perpetual franchises. Most states are holding on to water power rights, and laws prohibiting watering stock and excessive capitalization are becoming general. With these general legislative acts have come more carefully drawn local acts; with home rule has come local legislation tending toward a greater centralization of administrative authority in cities.

The Des Moines commission plan of government has found much favor and many converts. Many cities have adopted charters very similar to the Des Moines plan. To me, however, it does not seem that the commission plan is the one to survive. Already there are signs of the passing of the wave in this direction, although its influence is left in a trend toward smaller legislative bodies and more centralized administrative authority. The very legislation which has given home rule to cities is destructive of the commission form. It is but a very short step from home rule for cities to similar rule for subdivisions of cities. Home rule places in the hands of the people themselves the decision as to the form of government. It takes from the hobby-riding few the power to give to a city a commission form. The people in general, the workingmen in particular, do not look with favor upon any plan of government which makes the legislative body of the city less directly responsible to themselves. For this reason it is likely to be much harder to elect aldermen at large than to elect them by wards. The people like to have a man who resides in their very neighborhood, to whom they can go for such legislation a sthey desire, and whom they can hold responsible for whatever is done that does not appeal to them individually.

In the small commission, elected at large, the workingman seems to see a local autocracy, for which he will in rare cases vote, but this same workingman is not blind to the disadvantages of an unwieldy body; therefore, under home rule, the people will seek a smaller legislative body, but will at the same time insist that that body be elected by wards or districts, and be held directly responsible to the electors.

The workingman in the same manner recognizes the great advantages of centralized administrative authority. He wants men in charge of the various departments of the city to whom he can go, knowing that he is going to the right man. If there is a hole in the street, he wants to know just what one man has the authority to order that hole filled up. If he wants a fire alarm box located on the opposite corner, he does not like to be sent around from one office to another to find the man who is clothed with the authority to order that box installed. Nothing so arouses the wrath of the average workingman like being sent from one office to another, being told at each, "Now, I have nothing to do with that matter; you will have to go to so and so." He wants to know just what one man is in authority over that particular department, and he wants to reach him without delay. This one thing has made the board system of government somewhat unpopular. Theoretically this system is absolutely correct. When it was first adopted, but a few years ago, it was at the height of its popularity and many cities adopted it. In most cases the mayor has the appointing power over the members of these boards; he named one member each year. It was believed that by having one member from each board retire annually, the element of politics would be kept out. This proved true to a considerable extent, but the fact

*A paper before the American Society of Municipal Improvement.

was overlooked that there is great danger of conflicts between the boards and the legislative body. Personally, I believe that the board system of government has been fairly satisfactory, all things considered.

With home rule smaller legislative bodies and greater centralization of administrative authority, come a still further taking of the reins of government in hand by the people. They now demand the right of initiating the right of legislation, to have the final say as to whether legislation shall become operative and to pull back into private life the official who does not give satisfactory service.

The initiative, referendum and recall have long been agitated by certain men, but not until recently have cities adopted them to any great degree. The referendum was first put into execution as relating to franchises. The general awakening of the country to the great value of franchises and the general demand that all franchises should yield a return to the municipality, resulted in a demand on the part of the people that they should say finally whether the franchise should be granted or not. In most instances, the legislative bodies were only too willing to leave this question up to the people. When the people voted that a franchise was right, the legislative body was relieved of all responsibility. Every community has it quota of men who will cry "steal" every time a franchise is suggested. They do this without reason, usually without knowledge or ability to absorb knowledge. The cry "steal" goes far with the people, and many a city may have refused a franchise which was for its own good, simply because the mass of the people were misled by the cry of "steal." This is the danger of the referendum. I believe the dishonest officials are the rare exceptions, and I am optimistic enough to believe that dishonesty has not gained such headway in this country that whole legislative bodies, surrounded as they are by the safeguards of executives with veto powers and newspaper reporters seeking the first sign of a dishonest act, that many great "steals" are likely to be pulled off. Therefore I believe the legislative bodies are in general perfectly capable of securing in franchises provisions valuable to the people, but when the people are misled by the set of persons who unreasonably, unjustly, and ignorantly cry "steal," they have only themselves to blame if they find out afterward they have turned down a good franchise.

The initiative was next to be received, most cities now recognizing the right of the people to demand certain legislation. Even cities that have no such provisions incorporated in their charters, recognize the principle by enacting legislation which is demanded either by the newspapers, or by a petition of citizens, or by simple request.

The recall is still on trial. It seems to be growing in popularity. It must, however, be surrounded with proper safeguards. If an official is dishonest, incompetent or negligent, it is only right that those who have placed him in office should have the power and the necessary machinery to recall him. But the danger lies in a recall law so easy of operation that for some temporary unpopularity an official may be recalled or forced to go through a campaign incurring expense and hard work. Therefore I say the recall must be properly safeguarded. As an instrument of protection against dishonesty or incompetence it is right, but a succession of elections and changes in office, such as Los Angeles recently went through, should be avoided.

Municipal ownership of public utilities is a question attracting more and more interest daily. For years most cities have owned and operated their water works systems and street lighting plants. Modern science has brought the garbage destruction problem and the street railway problem before the people. In general, it seems the garbage problem is best handled by the municipality. This is particularly true of garbage collection, while destruction might possibly be handled satisfactorily by private corporations and without expense to the city. Public ownership of street railway and gas plants and commercial electric lighting plants, is open to argument. With the vast operating expense and heavy maintenance costs of either of these public utilities, and considering the enormous difficulties in keeping politics out of municipal operation, I believe that public utilities outside of water works systems and street lighting systems should be operated by private individuals, and controlled by the municipality by close and consistent regulation.

Water works systems and street lighting systems are strictly necessities and are not operated for revenue; while commercial electric lighting and power and gas and street railway systems come under the head of commercial enterprises, and this, in my opin-

ion, should not be within the province of the municipality.

The tendency of American times is toward municipal ownership; the demand goes up from every section of the country, and it constantly embraces new enterprises. It is my firm conviction that this tendency toward municipal ownership is fatal to American institutions, and American municipal government, unless coupled with a tendency toward a reduction of public affairs to an absolute business basis.

All practical, public problems must be shorn of their political significance and brought to a moral plane; and moral ethics in public affairs are just plain, ordinary, square-deal business ethics.

It is much easier to be critical than to be correct, and perhaps I have only pointed out the trouble without suggesting a proper remedy; but, frank admission of the real cause at fault, and frank consideration of the possibilities of reform are the only methods upon which we can rely for better government.

Report of Sub-Committee on Brick Paving of American Society of Municipal Improvement

By Edward H. Christ, Member of Board of Public Works, Grand Rapids, Mich.

GRAND RAPIDS laid its first brick pavements about twenty years ago. Since that time we have tried every method known to improve them.

Fortunately, our charter gives the board of public works absolute control of how a street shall be constructed, after the same has been ordered by the council. This gives us the opportunity of taking advantage of every proposed suggestion that would improve our pavements.

We are now constructing pavements practically along lines recommended by the No. 1 specifications of the National Paving Brick Manufacturers' Association, in order to determine their good and bad features. Considerable objection has been made to certain particulars in these specifications (which our inspectors and contractors call frills), such as rolling the sand and using a template to spread the same, also in the manner of applying the filler. But after careful consideration and investigation, I think these requirements can be done better, cheaper and with less experienced help, by following the specifications.

The brick manufacturers are very much dissatisfied with the present rattler test, and are designing one which it is hoped will give a uniform test.

Specifications for this rattler were promised to the Organization of City Officials for Standardizing Paving Specifications, not later than August 1. Unfortunately, the channel plate they intended using for staves proved to be unsatisfactory.

In a recent letter from Mr. W. P. Blair, their secretary, he said they expected to have a report to make at this meeting, also a rattler on exhibition, which, with the report, will disclose the progress so far made.

There is no question but what tests in the past have not been uniform, although in the larger cities I do not think the difference has been as great as in the quality of the brick furnished by the manufacturers.

Without a doubt most engineers would prefer to have the manufacturers design the rattler, as it will eliminate all criticism now advanced by them regarding the manner in which present tests are made, and will put it squarely up to them to furnish brick that will fill the requirements specified.

When the new rattler is perfected it will be the duty of the committees of the different societies to make a series of tests to enable them to decide upon the per cent. of loss they would recommend.

In our city we have taken two samples of brick from each car received this year; one of them is being tested in the rattler we are now using; the other in the proposed new rattler. This will enable us to note the relative difference between the two rattlers.

Not until cities construct their brick pavements under a standard specification will it be possible for any one to account for the many defects now noticed, because conditions are different in the various sections of the country.

The majority of this committee are also members of the brick committee of the Organization of City Officials for Standardizing Paving Specifications, and it is hoped we will be able to present a complete specification to that organization at its next meeting, to be held in New York City, January 10 to 14, 1911.

EDITORIAL COMMENT

Standardizing Specifications.

The Standard Rattler for Testing Paving Brick.

STANDARDIZING SPECIFICATIONS.

Perhaps the most important action taken by the Erie convention of the American Society of Municipal Improvements was the adoption of an amendment to the constitution making its committee on standard specifications one of the regular standing committees and placing it in charge of the whole field of specifications for municipal work, with power to appoint sub-committees. If now, this committee is put in charge of an energetic, broad-minded man, thoroughly acquainted with the municipal field and the experts in that field, it can make a deep impression upon future municipal engineering practice.

That such a committee is needed was recognized last year, when the first special committee on this subject was instituted, but there seems to have been much misunderstanding by the officials of the society of the intended scope of the committee, and the committee itself waited too long for the action of the Chicago convention for standardizing paving specifications to do any work itself. Late in the summer the chairman appointed a number of special committees, mainly on paving specifications, although this was but one portion of its field. But four of these made reports at the convention and they had not been considered by the general committee before presentation. They were received and filed for further consideration by the new standing committee and the society.

That the movement was slow in starting is shown by the interest in the Chicago convention last February, called to standardize paving specifications. This convention resulted in the formation of the Organization of City Officials for the Standardization of Paving Specifications, an organization which limits itself to but one portion of the field placed in charge of the new standing committee of the A. S. M. I. This organization meets again in January to review and extend its work of last winter. Its life will probably be limited if its title is not broadened, and, in fact, it should be merged in the A. S. M. I., where it can use the force and prestige of that society and have the steadying influence of its conservative temperament. Many city officials are members of both organizations and recognize after their study of the situation the logic of this position. But one obstacle to this combination of forces has been mentioned, an apparently unreasoning fear that if the newer organization should have associate members from among the men engaged in the supply of materials and the construction of works it might be unduly influenced by them or at least there might be suspicion of such undue influence. This fear was expressed in the discussion of the plan of the organization. Rather inconsistently, the organization provided for such associate memberships with dues so high that the outsider would be much disposed to question the motives of one joining under the present regulations if not of the organization in accepting him. That tightly drawn membership lines are not complete safeguards against outside influences has been demonstrated by past experience. The A. S. M. I. has encouraged associate membership within certain quite well defined limits for the undoubted benefits which result, and does not hesitate to draw its lines closely when there is any disposition to overstep them. No one fears any undue influence upon any action of the society whether from within or without.

There are several associations now in existence which have committees

considering standards of various sorts, whether of qualities of materials or workmanship, tests, specifications and the like, and they attack the problems from various points of view. The municipal engineer can use all the material developed by the other associations and may have some modifications of his own, made necessary by the conditions under which he works. The committees of the two associations particularly mentioned should, of course, work together so long as they maintain separate organizations, and they should co-operate with the committees in other associations whenever such bodies take up the same subjects for discussion. Perhaps these two are the only ones considering paving specifications as such, but nomenclature of bitumens, creosote oils, cements, cast-iron pipe, special castings, electrical standards, etc., etc., are taken up by one association or another and are all within the scope of the committee of the A. S. M. I. and its sub-committees. They will not do their whole duty unless they avail themselves of the studies of these other societies and bring the results into as close conformity with approved standards adopted by such societies as the requirements of municipal work permit.

THE STANDARD RATTLER FOR TESTING PAVING BLOCKS.

One of the most interesting features of the Erie convention of the American Society of Municipal Improvements was the history given by Prof. Edward Orton of the efforts to develop a standard rattler which would eliminate all the variations in results of rattler tests which may be due to the design or condition of the rattler. The general statement was made that the channel iron staves, which have been used quite generally, have not proved satisfactory as regards durability, the change in form and condition of surface being so rapid that the necessary frequency of changes of staves to insure uniformity of results makes the maintenance of the rattler very expensive. The most promising form at the present time is a 6-inch 15½-pound channel iron reinforced by a ⅜-inch steel plate fastened to the web with countersunk bolts or rivets. While this has not been definitely adopted as the standard form it will be unless unexpected difficulties arise.

Professor Orton stated that two parallel sets of tests had been carried on, one by himself in his Columbus laboratory and one by M. W. Blair in the Indianapolis laboratory of the National Association of Paving Brick Manufacturers. These tests were made in two rattlers made exactly alike, using 6-inch 15½-pound channel iron for the staves. The samples of brick used were obtained by one man from one factory and the 20 bricks in each sample were divided equally between the two laboratories and so marked that the results of the tests on the 10 bricks of a sample in one laboratory could be compared with those on the other 10 bricks of the same sample in the other laboratory. Chilled cast-iron cubes were used as the abrasion material in some tests and spheres in others.

When two sets of these samples had been tested, being some hundred samples in all, comparisons were made between the results at the two laboratories. It was discovered that there were nearly constant differences between the tests at the two laboratories. Thus the tests with cubes at one laboratory would show continuously higher losses from abrasion than the other, the percentage of difference being fairly constant. It happened that the results with spheres varied in the opposite direction.

This led to a study of the shot used and it was found that the differences in results from the two laboratories were due to differences in hardness of the shot, which in turn were due to differences in chemical composition.

In a third set shot of the same hardness were used in each rattler and the results came to a practical agreement. It is evident, therefore, that the specifications must include a standard composition of the shot used.

Spherical shot give more nearly uniform results than cubical shot, and therefore the spherical form will probably be made the standard.

Some of the members of the committees on specifications for brick paving of the associations of municipal officials are very anxious to have the specifications for the standard rattler completed immediately, and tentative specifications could be written at this time, but a number of questions of detail have not yet been settled and there may arise some such unexpected difficulties as that of the necessity for a standard hardness of shot.

Professor Orton gave a brief statement of the program for future tests to determine these details and it would seem to be prudence to wait for even a tentative specification for a rattler until these tests are completed and thoroughly checked. The general form of the specifications and approximations to most of the details are now available and, after so long a time of waiting, a few weeks more should not be unbearable.

After the standard rattler is defined will come the question of standards for abrasion tests of bricks, and of standard sizes for bricks and blocks. The former, at least, must wait until the rattler problem is solved. The first step toward the determination of the latter was taken in the resolution adopted by the A. S. M. I., asking the N. P. P. M. A. for its ideas regarding the possibilities of fixing standard sizes for bricks and blocks.

THE QUESTION DEPARTMENT

Dealers in Crushed Granite and Marble.

Will you kindly favor us by send to us the address of some company from whom we can obtain crushed marble and granite?

P. & A., Zanesville, O.

The following are those nearest Zanesville whose names are at hand: North Georgia Marble Co., Talona, Ga.; American Crushed Stone Co. (granite), 2 Webster Ave., Chicago, Ill; Dolese & Shepherd Co. (granite), 184 LaSalle St., Chicago, Ill.; Wisconsin Granite Co., Chamber of Commerce Bldg., Chicago, Ill.; Petersburg Granite Co., 3 E. Lexington St., Baltimore, Md.; McClenahan Granite Co., Port Deposit, Md.; Booth & Flinn (granite), 1942 Forks Ave., Pittsburg, Pa.

Specifications for Expansion Joints in Cement Walks.

In the construction of sidewalk paving I am laying off the sidewalk in 5-foot blocks, and between these blocks I am using tarred paper to keep the blocks open and as an expansion joint. Some persons advocate a sand joint between the blocks and some advocate other kinds of joints. Now I wish you to let me have your opinion what is the best joint.

D. G. A., Baltimore, Md.

The standard specifications for Portland cement sidewalks of the National Association of Cement Users apparently assume two reasons for making joints in cement walks. One of these is the expansion of the walk, and the clause covering this is as follows:

In every 50 linear feet of walk at least a ½-inch expansion joint shall be provided. Any means which will provide this will be acepted.

Another is the localization of any movements of the walk, due to expansion, contraction, settlement, etc. This is covered by the following:

The slabs or independently divided blocks when not reinforced shall not have an area of more than 36 square feet or have any dimension greater than 6 feet. Slabs of more than 36 square feet shall be reinforced with ¼-inch steel rods, spaced not more than 9 inches apart, or with smaller rods or fabric of equal strength.

This construction usually prevents cracks in the walk, for any strains or movements are taken care of in the joints, thus relieving the blocks and greatly reducing the chances of cracks in the blocks on account of excessive strains.

The "Handbook for Cement Users" ($3), gives a number of standard specifications for laying cement walks, most of which provide sand joints entirely through the base and wearing surface. One set of instructions has the following paragraph:

Do not allow any block to bear directly against any solid body, such as stone curb, building, post, manhole rim, etc. Leave the same space (about ¼ inch) between pavement and such fixtures as is between the block themselves. This note applies to the base and top as designed to avoid cracks and chipping due to expansion and contraction from temperature changes. This space can be conveniently provided for by the use of thick tar paper or felt.

With respect to making joints in the walk, the standard N. A. C. U. specifications, above referred to, provide as follows:

After the wearing surface has been worked to an approximately true plane the slab markings shall be made. If joints have been provided in the base during construction or have been cut in the base prior to spreading the wearing surface, the markings shall be made with a tool which will cut entirely through the surface and completely separate the wearing surface of adjacent slabs. If joints have not been provided in the base they must be made with a tool which will cut through to the slab-base and completely separate adjacent slabs. The slabs shall be rounded on all surface edges to a radius of about ½ inch.

Another set of instructions advises laying the walk in alternate blocks. It continues as follows:

On the same day, as soon as the concrete has set, remove crooswise and center scantlings, place a sheet of tar paper on the edges to separate them from all other squares and fill in the spaces thus left with the base concrete. Mark the scantling to show where the joints come. The finishing coat should be spread on before the concrete has taken its set, and smoothed off with a screed or straight edge run over the scantlings. Smooth with a wooden float and groove exactly over the joints between the concrete base blocks so as to bevel the edges of all blocks.

One city specification provides that the concrete shall be laid in blocks of (given) dimensions with expansion joints separated by two pieces of 3-ply asphalt paper at each 33 feet of line; intermediate joints cut through as the engineer may direct. The wearing surface shall be cut in blocks the same size as the concrete base and directly over these joints.

A more detailed description of the method of laying blocks provides that the strips of tar or felt paper shall be ¼ inch thick and the same width as the thickness of the concrete foundation. There can then be no interference of the tar paper with the cutting and finishing of the joints in the wearing surface.

In general, therefore, it may be said that while the more common practice is to make the joints in the concrete base of a cement sidewalk by cutting through it with a proper tool and filling the cut with sand, it is also permissible to use tar, asphalt or felt paper to make these joints provided it is not allowed to interfere with the proper cutting and finishing of the joints in the surface coat immediately over, and connecting with, the paper joints in the concrete foundation.

The question of expansion joints is one depending somewhat on locality. The first specification given, of the National Association of Cement Users, is a safe one to follow, but it is more common practice to make all the joints expansion joints, making them wide enough to allow for expansion space of width equal as a whole to that specified in the Standard when taken as a whole.

Concrete or Vitrified Clay Sewer Pipe.

This city is contemplating the laying of an extensive sewer system, and I write to inquire of you where to look for the best information relative to the merits of cement and clay pipe. It is represented to our sewer committee that the glazed cement pipe made by the "Thomas" machine, manufactured at Tacoma, Wash., will disintegrate and that concrete sewer pipe has not proved satisfactory. The cement pipe is sold here for less than the clay.

If you will kindly refer me to books or articles giving me the desired information, your courtesy will be greatly appreciated.

J. H. A., Salem, Ore.

The relative merits of concrete and clay sewer pipe have been discussed quite freely of late. Unfortunately too much of the discussion has taken the form of attacks upon the one material by the adherents of the other, and the defective work with each has had more than its fair share of attention.

It is undoubtedly true that clays which are not suitable for sewer pipe have been used for that purpose and that such pipes have disintegrated and have crushed under the super-imposed weight of earth or rock. It is equally true that unsuitable materials have been used in making concrete pipe and that they have also disintegrated. Bad workmanship in making and laying pipes have had their effect in producing failures in sewers laid with clay pipes and in others laid with concrete pipes. Acids, alkalies, etc., have attacked both kinds of pipe and produced their effects.

On the other hand, vitrified clay pipe sewers laid in the early history of the art of making and laying them are still where they were put, and in the same good condition as when laid; concrete pipe sewers made with natural hydraulic cement have been in use for forty or more years and are still in good condition, and Portland cement concrete sewers have been in use nearly as long.

Engineers have had enough experience with both kinds of material to make specifications which will insure good material and workmanship, provided the inspection is sufficiently expert and honest to bring the material and construction up to the specifications. The principal, indeed, the only requirement, is competent, reliable, honest, strong engineers and inspectors and the undivided support of the municipal authorities in their efforts to get the results they know are possible.

The books written on the subject are

mainly unreliable because written to support one material and attack the other, so that they suppress the undesirable failures on one side and the successes on the other. The text-books on sewers, such as Folwell's "Sewerage" ($3), Ogden's "Sewer Design" ($2), and "Sewer Construction" ($3) give little on the differences between the two materials, but describe structures made with both and endorse them both. The subject has been discussed in one phase or another in several articles in MUNICIPAL ENGINEERING, among them the following:

In vol. xxxix: "Effect of Sewage and Sewage Gases on Portland Cement Concrete," p. 41.

Vol. xxxviii: "Cities Using Concrete Pipe Sewers," p. 40. "Forms for Concrete Sewers," p. 420.

In vol. xxxvii: "Experience with Concrete Sewers," p. 34; "The Destruction of Concrete by Alkali," p. 112; "Concrete Sewer Pipe for Denver, Col.," p. 203; "Articles on the Effect of Acids and Alkalies on Reinforced Concrete," p. 183; "Concrete and Brick Sewers," p. 243.

In vol. xxxi: "Limestone in Concrete for Sewers," p. 361; "Durability of Concrete Sewers," p. 108; "Natural Hydraulic Cement Sewer," p. 182; "Concrete and Vitrified Pipe for Sewers," p. 379.

In vol. xxxv: "Concrete Sewer Pipe," p. 102; "Durability of Cement and Concrete in Sewers," p. 114; "Concrete and Brick for Sewers," p. 178; "Effect of Alkali Soils and Waters on Concrete," p. 37; "Salt and Sea Water for Mixing Concrete," p. 391; "Effect of Salt and Alkali on Concrete," p. 385.

An extended list of articles is given in vol. xxxviii, p. 192.

Cities Using Calcium Hypochlorite in Water Purification.

We are considering treating our water supply with sodium or calcium hypochlorite. We pump from 400,000 to 500,000 gallons per day. This must be done in the simplest manner possible. Kindly place me in touch with parties manufacturing the equipment necessary for this installation. If no one manufactures this special machinery, kindly inform me of the names of those who have installed such treatment.

N. H. M., ———, W. Va.

Minneapolis, Minn., Boonton reservoir, Jersey City, N. J., Poughkeepsie, N. Y., McKeesport, Pa., are a few of the cities that have experimented with calcium hypochlorite in sterilizing water supplies. The same chemical has been used in treating sewage at Red Bank, N. J.; Walbrook, Pa.; Baltimore, Md.; Bubbly Creek, stock yards, Chicago, Ill. Many water works superintendents have used the process occasionally, some results being reported in recent numbers of MUNICIPAL ENGINEERING, such as vol. xxxix, p. 222, being a study for New York City conditions; vol. xxxviii, p. 313, being a report of experiments by the Baltimore (Md.) County Water and Electric Co., at Avalon, Md., with hypochlorite of calcium; vol. xxxvii, p. 383, at McKeesport, Pa.; vol. xxxvii, p. 23, at Gruenewald, Germany; pp. 6, 86, 158, at the Boonton reservoir of the Jersey City water supply; p. 365 on sewage disinfection.

Combined Electric Light and Water Plants.

What can you tell me about combined electric light and water plants? Are they many of them, and of what size are they? Are they under municipal or private ownership? SUBSCRIBER.

There are many of these combined electric light and water plants in small cities, towns and villages. They do not seem to be popular, for rather obvious reasons, in the larger cities. In MUNICIPAL ENGINEERING, vol. xxxvii, p. 257, will be found a partial list of cities owning both electric light and water plants, but they are all operated separately.

From the *McGraw Electric Directory* can be selected quite a complete list of the combined water and light plants.

Alabama has 13 municpal plants and 6 under private ownership in towns varying in population from Samson (municipal), with 300, to Dothan (municipal), with 5,275 in 1900.

Alaska has two plants, at Valdez with 315 and Ketchikan with 1,200 population, both under private ownership.

Arizona has four private plants serving populations from 350 in McCabe to 5,500 in Nogales.

Arkansas has 7 municipal and 15 private plants serving populations varying from 125 in Junction City (private) to 15,000 in Hot Springs (private).

California has 4 municipal and 18 private plants, populations varying from 300 in Butte City (private) to 5,000 in Palo Alto (municipal).

Colorado has 3 municipal and 5 private plants, populations varying from 364 in Holly (municipal) to 3,775 in Canon City (private).

Connecticut has 3 municipal and 2 private plants, populations from 1,213 in Newark (municipal) to 3,667 in Westport (private).

New Castle, Del., 3,380 population, has a private plant.

Florida has 4 municipal and 5 private plants, populations varying from 366 in Winter Park (private) to 6,509 in Lake City (municipal).

Georgia has 25 municipal and 6 private plants, population varying from 503 in Vidalia (municipal) to 9,453 in Brunswick (private).

Idaho has 5 private plants, populations served being from 200 in Meridian to 4,046 in Pocatello.

Illinois has 14 municipal and 23 private plants, populations ranging from 417 in North Chillicothe (private) to 25,506 in Bloomington (municipal).

Indiana has 24 municipal and 28 pri-

vate plants, populations ranging from 765 in Zionsville (private) to 12,300 in Shelbyville (private).

Iowa has 10 municipal and 7 private plants, populations varying from 956 in Lisbon (municipal) to 5,041 in Le Mars (private).

Kansas has 15 municipal and 5 private plants, populations varying from 800 in Kiowa (municipal) to 13,024 in Hutchinson (private).

Kentucky has 1 municipal and 11 private plants, populations varying from 654 in Pembroke (private) to 4,081 in Mayfield (private).

Louisiana has 13 municipal and 2 private plants, populations varying from 800 in Tallulah (municipal) to 15,000 in Lake Charles (private).

Maine has 1 municipal and 5 private plants, populations varying from 88 in Belgrade Lakes (private) to 4,758 in Caribou (private).

Maryland has 1 municipal and 4 private plants, populations varying from 215 at Lock Lynn Heights (private) to 3,199 in Westminster (private). Part of Baltimore and several of its suburbs are also supplied by a company.

North Attleboro, Mass., 10,500 population, has a municipal plant.

Michigan has 31 municipal and 5 private plants, ranging in population from 450 in Silliman (private) to 22,172 in Lansing (municipal).

Minnesota has 38 municipal and 3 private plants, populations ranging from 350 in Belgrade (municipal) to 9,574 in St. Cloud (private).

Mississippi has 23 municipal and 3 private plants, populations ranging from 263 at Belzona (municipal) to 4,944 at Yazoo City (municipal).

Missouri has 19 municipal and 12 private plants, populations ranging from 632 in Forest City (municipal) to 45,000 in Joplin (private).

Montana has one municipal and 5 private plants, populations ranging from 90 in Gardiner (private) to 10,000 in Missoula (private).

Nebraska has 8 municipal and 2 private plants, populations ranging from 850 in Randolph (municipal) to 7,380 in Nebraska City (private).

Nevada has 6 private plants with populations ranging from 150 in Fallon to 15,000 in Reno.

New Hampshire has a municipal plant at Littleton, population 3,702, and a private plant at Warren, population 791.

New Jersey has 8 private plants, population ranging from 70 in Deal to 6,845 in Summit.

New Mexico has private plants at Santa Fe population 8,000, and Tucumcari, population 800.

New York has 5 municipal and 3 private plants, populations ranging from 1,231 in Cape Vincent (private) to 35,743 in Elmira (private).

North Carolina has 9 municipal and 1 private plant, populations ranging from 1,072 in Dunn to 4,610 in Gastonia, both municipal.

North Dakota has 5 private plants serving populations ranging from 1,125 in Williston to 4,059 in Valley City.

Ohio has 29 municipal and 12 private plants, populations varying from 626 at Mt. Pleasant (private) to 21,000 at Norwood (municipal).

Oklahoma has 12 municipal and 3 private plants, populations varying from 450 at Fairview (municipal) to 3,800 at Stillwater (municipal).

Oregon has 3 municipal and 13 private plants, populations ranging from 127 at Vale (private) to 5,000 at Medford (private).

Pennsylvania has 1 municipal and 6 private plants, populations ranging from 250 at Colemanville (private) to 10,832 at Carlisle (private).

Wickford, R. I., population 1,500, has a private plant.

South Carolina has 6 municipal and 8 private plants, populations ranging from 449 in Pickens (private) to 8,000 at Rock Hill (private).

South Dakota has 2 municipal and 1 private plant, populations ranging from 391 at Wilmot (municipal) to 3,265 at Brookings (municipal).

Tennessee has 16 municipal and 5 private plants, populations ranging from 210 in Millington to 17,193 in Jackson.

Texas has 3 municipal and 36 private plants, populations ranging from 635 in Marble Falls (private) to 22,258 in Austin (municipal).

Elgin, Utah, population 150, has a private plant.

Morrisville, Vt., population 1,087, has a municipal plant.

Virginia has 1 municipal and 6 private plants, populations ranging from 1,220 in Shenandoah (municipal) to 5,300 in Clifton Forge (private).

Washington has 11 private plants, populations served ranging from 254 in Pasco to 6,976 in North Yakima.

West Virginia has 9 private plants, populations served ranging from 442 in Welch to 23,000 in Charleston.

Wisconsin has 16 municipal and 10 private plants, populations ranging from 612 in Bruce (municipal) to 37,643 in Superior (private).

It should be noted that only four cities in the list, Bloomington, Ill., Elmira, N. Y., Superior, Wis., and Joplin, Mo., have more than 25,000 population; there are 24 cities of 10,000 to 25,000 population; there are 49 cities of 5,000 to 10,000 population; there are 618 cities and towns of less than 5,000 population; making a total in the list of 695 cities and towns. In other words, 89 per cent. of the cities and towns having combined electric light and water plants have populations less than 5,000.

As to ownership, 364 are under muni-

cipal ownership and 331 under private ownership, a practical equality. There are great differences in the proportions of the two classes of ownership in the various states, however. Thus, there are 11 states which have no municipally owned plants, all being among the newest western states except Delaware, New Jersey and West Virginia. Vermont and Massachusetts have each but one plant and that municipally owned.

Alabama, Georgia, Kansas, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, North Carolina, Ohio, Oklahoma, Tennessee, Wisconsin, have a large preponderance of municipally owned plants, while Arkansas, California, Illinois, Kentucky, Oregon, Pennsylvania and Texas have a preponderance of privately owned plants, in addition to the states named above having only such plants.

The geographical distribution of these groups of states is of interest, especially when taken in consideration with the dates at which development of improvements in small cities began in the respective states.

Information About Gas Manufacture.

We are referred to you by Mr. J. M. Lloyd, Associate Editor of the *Iron Age*, for information about the installation, manufacture and operation of plants for producing gas for heating and lighting of a capacity to supply a population of 25,000 to 50,000.

What is the approximate cost of a plant and the street mains for an area both two and three miles square with glacial soil conditions?

What is the best process at this date for producing the richest gas for the purposes named, and to produce it save all by-products? What are the principal by-products that are worth saving, and what is the value of each at the plant in this vicinity? Is there a ready market for these by-products? Does your answer to the first question cover the cost of a plant as indicated in this paragraph? If not, make it do so.

What is the Solvay Process, and is gas a principal or by-product by it? Is the gas by it of first quality for the purposes named?

What are the gas values and by-product values both in quantity and items and in dollars and cents of a ton of coal of the leading gas and coke producing varieties of coal? R., ———, Ind.

It is impossible to give satisfactory answers to these questions even in a general way. To answer them specifically would require full knowledge of the local conditions, including the relative importance of first cost and cost of production, an item which would demand full consideration of the financial questions involved. This would require the services of a consulting engineer with experience in these matters. The following general information may be given, mainly to show the difficulties in the way of such treatment of the subject, and to give some idea of the problems to be met.

There are great variations in cost of plants and some variation in cost of systems of distributing mains. Methods of fiancing a proposition will also have much influence on the cost of a plant. The range of areas and possible populations and uses of gas in the question is very large. Plants with capacities within the given limits have been constructed at costs varying between $200,000 and $1,200,000. The kind of plant chosen is another factor accounting for the large differences between maximum and minimum cost.

Probably the coal gas process would be considered by unprejudiced observers to be the best under ordinary conditions. The principal by-products of the coal-gas process are coke, which sells for, say $4 to $6 a ton, according to the relation of the local demand to the supply furnished by the gas works; tar, which sells for, say 2¼ to 2½ cents a gallon, 8 to 10 gallons being obtained per ton of coal carbonized; and ammoniacal liquor at, say 1 to 2 cents a pound, according to strength, or say 20 cents a ton of coal carbonized.

If there is a market for the first class coke produced in a coke oven plant, such as the Otto, that process is still more economical than the coal-gas process. Assuming a market for the coke at its proper price, as compared with coal for the same high-grade uses, the gas is a by-product, as well as the tar and ammonia, and the money received from the sale of the gas is practically all profit.

The water-gas process requires less expenditure for plant, but there are practically no residuals and so the cost of gas has no credits to offset. The cost of making gas depends on the cost of oil and fuel. Many plants use combinations of coal and water gas, because the market for gas-house coke is likely to be slow and it can be used in a water-gas plant to advantage. There are, therefore, few pure coal-gas plants. Water-gas plants are economical in small cities and towns where the daily consumption is not sufficient to keep the smallest practicable plant running all the time, for the expense of stopping and starting the plant is much less than for the other processes.

Assuming a coke-oven plant to cost $1,200,000, a coal-gas plant will cost, say $900,000 for the same capacity, and a water-gas plant say $800,000. Such a plant might serve the larger area in one city and might be required for the smaller area in a city where there was large demand for gas. It is quite possible that for the smaller area named and for a rather sparse population or few consumers, a plant could be constructed for the minimum figure quoted, giving no chance for expansion without addition to plant. All of these figures must be in the nature of guesses until full and definite information regarding the local conditions is obtained.

The Solvay process is a process of making coke, similar to the Otto process, and gas is a by-product. Part of the gas produced is of high quality, and if only this

part is saved for use of consumers of gas the service will be satisfactory. The poorer portion of the gas is used in heating the coke ovens, under the boilers in the plant, etc.

The best sources of information regarding the gas and by-product values of coals are the recent reports of investigations of coal by the Geological Survey and other U. S. Government departments. They can now be obtained of the newly established Bureau of Mines, Department of the Interior, at Washington, D. C.

Books on Portland Cement Manufacture.

Will you please state the name of some reliable work giving all necessary instructions for manufacturing Portland cement and estimates of cost, tests as to suitable raw material, etc.

C. M., Selma, Ala.

Eckel's "Cements, Limes and Plasters" ($6) is the most complete book on the manufacture of these materials. There is also a book on "The Cement Industry" ($3) which is now somewhat out of date, but gives descriptions of a number of plants in this country and abroad. H. S. Spackman has a book on "Cement Manufacture" devoted mainly to descriptions of the machinery used.

How to Find Leaks in Water Mains.

As you have a question department I would like to know if you can give me any information which will assist us to locate leaks. We are pumping a great deal more water than should be used and we feel sure a great deal of it is wasted as the water in our elevated tank disappears so rapidly at night when there is very little being used.

We presume that some of this is caused by people letting the water run in summer time to keep it cool and in winter to keep pipes from freezing, and also that some is lost through neglect to repair automatic pumps and valves; consequently we are now having an ordinance prepared requiring the water takers to install meters.

However, we do not believe that this accounts for all of the waste and we are at a loss to know how to locate any leaks in the mains. We know that ordinarily, where there is a leak in the main, water will come to the top of the ground, but here there is tile laid on nearly every street where there is a main and oftentimes the two strings are less than a foot apart, so it seems to us that the water might go from the leak in the main to the tile and never show on the top of the ground.

If you can give us any information which will assist us in determining whether there are such leaks and if so where to locate them we will be under many obligations to you, for we are pumping a good many more hours than we think should be necessary.

S. A. F., Mayor, ———, Ill.

This is one of the most vexatious problems with which the water works manager has to deal. It is comparatively easy to find house connections through which waste is taking place, by a house to house inspection and by a water phone, or even a common key for turning off the water, the sound of the running water being transmitted through the rod to the ear held against it. This inspection being made at night when all water is supposed to be turned off in the houses will give the basis for house inspection and location of leaks.

Leaks in street mains are harder to find. A complete system of valves whereby the system of pipes can be divided into small districts will aid most materially in the search.

The Deacon and Rodda water waste detectors, for house connections, and the use of meters in determining waste from districts are briefly described in MUNICIPAL ENGINEERING, vol. xvi, p 242. The report of the water works department of Columbus, O., for 1902, gives the method of making a leak survey for the city. A test for leaks in a pipe laid under a river is described in vol. xxviii, p. 384. The results of the use of the pitometer in making a leakage survey in Spokane are given in vol. xxviii, p. 477. This method is probably too expensive for application to a small system. A very full detailed description of "How to Find Leakage in Water Mains and Services," by a water works superintendent will be found in vol. xxxvi, p. 319. Two brief articles giving some suggestions are on p. 108 of the same volume. A description of the use of the pitometer in measuring water waste is given in vol. xxxvii, p. 257. A full description of the aquaphones or waterphones for detecting flow of water through valves or connections is given in vol. xxxvii, p. 329.

Books and Patents on the Septic Tank.

Kindly advise me of a good book on septic tank construction, in the simple form. Also I wish to avoid conflicts with patent rights and I would thank you for any information as to who, if any one, controls the right to use the simple septic tank.

I am figuring on a sewer system and would be grateful to you for this information. Yours truly.

R. L., ———, Cal.

See the article in this department under the heading, "Books on Sewage Disposal," for answer to the first part of the question.

As regards the septic tank patents full information can be obtained by consulting the following articles in MUNICIPAL ENGINEERING on this and related subjects:

In vol. xxxix: "Cameron Septic Tank Patents," p. 238; and the article on "The Present Use of the Septic Tank," elsewhere in this number.

In vol. xxxviii: "New British Sewage Disposal Works," p. 177; "Information About Cameron Patents on Sewage Purification Processes," p. 192, giving descriptive references to a number of valuable preceding articles.

Books on Estimating.

Please let me know the title, price and place of sale of some of the most up-to-date books on contractors' estimates, covering concrete work, sewers, excavations, pipe laying, railway construction, paving, etc., giving unit costs.
P. M., Edmonton, Alberta.

Gillette's "Handbook of Cost Data" ($5) has some 1850 pages of information, more or less thorough and reliable, on this subject. The book can be used successfully by an experienced contractor or engineer if due care is used in applying the information to local conditions. This is, of course, true of any book of this nature. Arthur's "New Building Estimator" ($2.50) is a small book covering building construction and giving some data on the lines of work mentioned.

Books on Sewage Disposal.

Please give me a list of books on sewage disposal. R. R., Quebec, Ont.

Good lists of books and articles on sewage disposal will be found in MUNICIPAL ENGINEERING, vol. xxxiii, p. 175; vol. xxxviii, p. 346, and vol. xxxix, p. 291.

To the list of articles there given may be added the following in vol. xxxix: Sewage Purification by Irrigation," p. 38." "Covers for Septic Tanks," p. 39; "Effect of Sewage and Sewage Gases on Portland Cement Concrete," p 41; "Use of Sewage for Irrigation at Fresno, Cal."

Free Delivery of Express Packages and Telegrams.

The City of Atlanta is interested in securing free deliveries of packages or messages by express and telegraph companies. Your journal devotes much attention to municipal matters and it occurred to me that you might be able to refer to publications treating on this subject. J. L. M., Atlanta, Ga.

This is a question which has given considerable trouble in a number of cities. The question is readily settled if the original franchise to the telegraph company required free delivery within the city limits. If not so settled, as regards telegrams, and in any event as regards express packages, the free delivery may perhaps be secured through ordinances passed by the city council. The two classes of deliveries are on somewhat different basis, since the telegraph company occupies the streets with its poles and conduits and so comes under the control of the city authorities to a certain extent, while the express company can only be reached through ordinances taxing the business or the vehicles by means of which it is carried on. Even if the free delivery ordinance is beyond the power of the city council to pass, the same result may be obtained through the introduction of ordinances on the lines above suggested.

The ordinance in the City of Indianapolis, Ind., concerning telegrams, provides:

That it shall be unlawful for any telegraph company having in its possession a telegram or message for any one within the corporate limits of the city of Indianapolis, Indiana, to make a charge for the delivery of the same, except such charges as are necessary to pay for the transmission of the same to the office of the company within the corporate limits of the city of Indianapolis, Indiana.

Any one violating any of the provisions of this ordinance shall, upon conviction be fined for each offense in the sum of not less than $5, nor more than $50.

The only ordinance governing express companies is one assessing a vehicle tax of $12 a year for each wagon used in delivering express matter, and $1 a month for each new wagon put on during the year, from the date of beginning work.

Vacuum Street Cleaning Machines.

We should very much indeed like to know whether your publication has recently printed anything regarding the use of vacuum street cleaning machines, either in Europe or the United States, and if you know of any such devices recently patented in the United States, and what you think of their probable value. F. B., New York City.

Reference may be made to the August number of MUNICIPAL ENGINEERING, vol. xxxix, p. 115, for a statement of the recent patents on vacuum street cleaning. The Furnas machine long since demonstarted its success. Their new automobile machine was damaged by fire at the factory just as it was ready for trial, and is not yet repaired, but is promised shortly. The others are in the experimental stage.

Rock Island's Brightways.

Practically all the business houses on Second avenue, in Rock Island, Ill., have signed a contract for the installation of the cluster light system. Mayor G. W. McCaskrin has stated that he will endeavor to secure the approval of the council to the plan of using the lights on the four sides of Spencer square, and the People's Power Company is lending encouragement to the enterprise by announcing that a specially low rate for electricity will be made.

FROM WORKERS IN THE FIELD

Practical Points from Practical People.

Contributions to this Department are invited. Give from your experience for the benefit of others. No matter about the style of the composition, the fact is what is wanted.. Use the Question Department for what you want to know; use this Department for what you can tell others.

The Time to Kill Willows.

To the Editor of MUNICIPAL ENGINEERING:

Sir—In answer to the query of O. O. L., as to how to kill willows, I will say that there is only one day in the year when this can be done by the usual method of girdling. This is in August when the sign is in the heart. This is the testimony of a steamboat captain whom I heard discussing the question.

W. B. EELLS, Mount Gilead, O.

Unfortunately, this is quite too indefinite a statement regarding the one day, for there are twenty-two days in August when the sun is in the sign of the heart (Leo). This is an excellent example of the misapplication of an original rule which, perhaps, had some foundation in observations of facts, due to the ignorance and bad memory of the transmitters of the rule, and which thus becomes a superstition, pure and simple. Can any one give further information regarding this or any other method of stopping the growth of willows?

Relative Action of Calcium Chloride and Oil on Stone and Gravel Roads.

To the Editor of MUNICIPAL ENGINEERING:

Sir—The first essential factor of life and service in a stone or gravel road is a bond of moisture. Oil and water will not mix and stay mixed, even with a soap emulsion. The principal characteristic of calcium chloride is to gather and give out moisture, insuring a perfect moisture bond. It is, as stated in my article published in your September issue, a chemical sponge with a tendency to attach itself to any substance which does not have a greasy, oily property in it. This tendency bars it from successful use on roads that have been oiled, except in the filling of ruts where a prepared road material may be lodged and confined in considerable quantity. It is possible through this filling of rutty places, which develop very rapidly in oil-treated roads, to finally put on a new surface and so again recover the roadway.

Calcium chloride is the greatest known absorbent and retainer of moisture, with the possible exception of the sponge, and so must be a life-prolonging factor, when employed in and on a stone or gravel roadway. But to secure the best results, an artificial supply of water must be given it when rain, dew,, frost or damp air do not give a required quantity. These, however, supply so large a part of its need, that artificial watering is in no sense a burden or hardship nor an expense that will in any way measure up to the life-giving and sanitary conditions realized through a proper treatment and care of roadways.

As stated above, oil and water will not mix, and so an oil treatment must be made with the road surface as nearly dry as it is possible to get it. In excessively and long-continued dry weather with oil having a full portion of gum in its composition, it is possible to get a longer first hold down on the dust than with calcium chloride if used without artificial wetting. But as soon as the gummy properties of the oil are absorbed by the road material, as it will be in a few weeks or months, according to the quantity of heavy substance in the oil and to the traffic over the road, disintegration begins and develops rapidly, with a call for more and more oil to an ultimate point of a prohibitive cost. This, I believe, has been the experience of all who have tried oil to a final conclusion.

Again, the first cost of the oil treatment depends wholly on the quantity of heavy asphaltum body in the oil, and on this also depends its first life or action as a road binder and dust layer, and so the cost is measured entirely by this heavy substance, as is the service after treatment. I have never made any direct oil applications, and so cannot give relative costs except by citing the government report on oiled roads, which gives the cost as varying from three to fifteen cents per square yard. That report says that oil with a paraffin base is of little value as a dust layer or road binder, and that the cheaper estimates of cost are based on these light-body oils. The calcium chloride treatment costs from two to five cents per square yard, the excessive cost being principally in preparing the road and working the chemical into it.

Next, as to the staying or lasting qualities of the two treatments. As soon as an oil-treated road is subjected to a heavy

flow of water through a hard shower or long rain, a large part of the oil is washed into the gutters or sewers and with it go all loose, oily particles which will float on the surface. This is shown by the rapid accumulations of these particles in the gutters or road depressions. This loose dirt is soon ground into flying dust, but in this case your dust is greasy and smirches everything it touches. If calcium chloride is kept properly supplied with moisture, no dust will fly beyond the gutter line, and the moment the road surface is wet, any loose particles on it are immediately held in bondage. You will find very little loose material in the gutters of a chemically treated roadway, and, as nothing blows off the road surface, very little disintegration takes place.

Again, an oil-treated roadway when freshly treated is a very dirty and foul-cmelling thoroughfare. It is also slippery and dangerous for horse traffic, and very dirty and dangerous for auto traffic and distructive to rubber tires. If, on the other hand, proper drainage for the excess falls of water is provided, you never have a muddy or slippery road in a chemically treated roadway, nor one that will develop ruts or wheel marks to any great extent. Where they do develop from a compression of excessively heavy traffic and the heavier the traffic is on these (roads the better, as it means a thorough compacting) or the settlement of the base, these places are quickly filled with the mixed road compound, which may be mixed and kept indefinitely, ready for use in such cases. The traffic over these places, filled and tamped slightly to insure an even filling, will iron them down and give a surface as smooth as a sheet asphalt roadway, without any of the slippery, dusty and objectionable features of that roadway.

For horse traffic it is the ideal roadway, as it has enough elasticity in it to prevent the shock or jar of the harder pavements, and, on account of its packing properties, even as soft filling material as ashes and cinders, may be used. In the latter case, about 33 per cent. of coarse bank sand should be used in the body mixture. Through the lasting qualities of calcium chloride, large parts of each application are retained on the road top from year to year, calling for lighter applications each year with the possibility of skipping several years at frequent intervals. In other words, an oil-treated roadway grows rapidly worse with a relatively large increase in cost of maintenance, while with the chemically-treated roadway it is rapidly improving at a decreasing cost almost to the vanishing point.

S. G. Howe, Detroit, Mich.

Flushing Streets Under High Pressure.

To the Editor of Municipal Engineering:

Sir—In your October issue I read with interest the article written by J. W. Howard, New York City, under the heading of "Flushing Pavements with Water Under High Pressure," in which he quotes from an article written by me some time previous regarding the causes of defects in asphalt pavements which are entirely under the control of the municipal engineer.

The writer had two particular cities in mind when that original article was written. One was St. Louis, Mo., which Mr. Howard refers to in his article, and where the flushing is done by high pressure machines or wagons, and the other was Minneapolis, Minn. In this latter city the asphalt streets are sprinkled during the day by the old-style sprinkling wagons and are flushed every night with a stream of water from a three-inch fire hose under the full pressure of the water mains. Every slight hole or depression in the paving naturally collects dirt and required the full force of the water for several seconds to dislodge same. A stream of water capable of tearing through walls and partitions of burning buildings would surely seriously injure any thoroughfare when directed nightly on spots which were, perhaps, already showing signs of wear.

The Grand Canon of Arizona is caused by the running waters of the Colorado river gradually wearing away the mountainous rocks, so it is not surprising that many of our modern thoroughfares are seriously injured by the high-pressure flushing system of street cleaning adopted by the officials of many of our cities.

Isaac Van Trump,
Asphalt Chemist, Chicago, Ill.

..Vitrified Brick at the International Road.. Congress.

To the Editor of Municipal Engineering:

Sir: On page 276 of your October issue, Prof. E. D. Rich, of Ann Arbor, Mich., expresses surprise and regret that the second International Roads Congress at Brussels, apparently gave no consideration to vitrified brick pavements.

The subjects for consideration at these Congresses are selected by the Permanent Commission of the International Association of Road Congresses. The United States of America is not represented at present on this Commission, and in no other country that is represented, is the use of brick paving important enough, apparently, to have prompted its selection for consideration, at the Congresses.

The writer regrets the facts, and remembers some discussion at Brussels among the American delegates concerning them, but these delegates seemed powerless to do anything in the matter.

The writer agrees with many of the remarks of Prof. Rich, and begs to suggest that two courses lie open:

First—To secure representation of the United States on the Permanent Interna-

tional Commission, and, through such representation, to secure consideration of the subject in future Congresses; or

Second—To secure the consideration, by the addressing of a communication from those interested, to the Permanent Commission of the International Association of Roads Congresses.

The writer hopes one or the other—preferably the first course suggested—may be successful.

W. W. CROSBY,
Chief Engineer, State Roads Commission.
Baltimore, Md.

Repairing a Catchbasin.

A great deal of trouble has been encountered in the process of installing heating pipes through the downtown section of Indianapolis. The great numbers of water, sewer, telephone and other underground installations have made the matter of finding space for the new heat conduits a problem not easy of solution:

In addition to this trouble the soil is of a sandy gravel which flows so easily as to require sheathing on all the work. The trenches are of an average depth of 8 or 10 ft. and are sheathed with 2-inch planks braced with 4 by 4 inch blocks and the ordinary form of jack used on such work.

Recently during an excessively heavy rain an accident occurred which required rather unusual means of remedy. A trench had been constructed along one street and in turning at right angles to proceed down another street, a catch basin wall was made use of in the place of sheathing at one side of the trench. Owing to the suddenness and intensity of the rain, the catch basin was almost filled with water, and the extra pressure caused the failure of a weak spot in the wall, allowing the water to pour into the trench.

The break was exceedingly difficult to reach owing to the obstruction of the sheathing braces. Blocks of wood, boards, etc., were tried in an effort to stop the flow and prevent a complete flooding of the trench, but the head of about 6 ft. on the opening prevented such a remedy. The flow was finally stopped by using several bricks laid in place and held by a 2-inch board which in turn was backed by a block and jack set against the opposite wall of sheathing. The chinks between the brick were stopped with rags and such emergency packing as was available.

In the final repairs it was necessary to use rather novel means, as the opening was below the ordinary level of the water in the catch basin. A large half tile, used in the construction of the heat conduit to enclose the heat pipes and form an insulation, was set down inside the catch basin so as to enclose the opening. This was held tightly in place and the joints between the tile and the wall were made as tight as possible. The temporary stop was then removed and the opening bricked up from the outside.

MUNICIPAL MATTERS IN COURT

Decisions of the Higher Courts of Interest to Municipalities.

Municipal Corporations—Dissolution.—Where a municipal corporation has once been organized, it does not become dissolved by a mere failure to elect officers, or by a failure of such officers elected to perform corporate functions, but, for the purpose of being sued for corporate debts, continues to exist per se.—United States Bank v. City of Kendall (Kan.), 179 F. 914.

Highways — Establishment. — A road may become a public road by prescription. Evidence that the public had used the road continuously for 20 years, and that the proper county authorities during that time have recognized it as a public road by having the same worked, will be sufficient to authorize an inference that such road is a public road. In determining whether a road used by the public for the period of 20 years has been accepted by the authorities of the county, evidence that a public road overseer had caused it to be worked, and that, after complaint of a citizen to the ordinary of the county to take charge of the road, it had been worked by the road hands, is relevant and admissible.—Louisville & N. C. H. Co. et al v. Hames (Ga.), 68 E. 80. 5

Rural Ways—Defects.—A municipality is not required to exercise the same care in grading and constructing a rural way as when improving a street in the populous portions of the city. In improving and maintaining such roadways the city is not required to grade or improve to the entire width of the highway.—Neidhart v. City of Minneapolis (Min.), 127 N. W. 484.

Powers—Acquisition of Public Utilities.—The state may empower municipalities

to acquire and operate any such necessary public utility as is generally owned and operated in a city by public service corporations, such as waterworks, gas or electric light plants, street railways, etc. A municipality can acquire a street railway only under express authority from the state. Municipalities can exercise only such powers as are expressly or by necessary implication conferred upon them.—Platt v. City and County of San Francisco et al (Cal.) 110 P. 304.

Suits for Injuries—Notice of Claim—Subsequently Developing Injury.—Under a provision of Spokane charter requiring claims for personal injuiries caused by defects in streets, etc., to be presented within one month after the accident, a claim does not preclude recovery for injuries not specified therein where they developed after the time for filing the claim.—Pierce v. City of Spokane (Wash.), 110 P. 537.

Nuisance—Remedy by Injunction.—The erection and maintenance of a wagon yard in a city for the shelter of farmers' and peddlers' wagons loaded with farm produce is not a nuisance per se, and equity will not enjoin its erection.—Cooper v. Whissen et al. (Ark), 130 S. W. 703.

Water Rents—Leases to Private Individuals.—A village leasing its waterworks to individuals may protect its inhabitants from excessive charges for water supplied by the individuals and as a part of the consideration for the lease the individuals may agree with the village to supply water free of charge to engine houses, schoolhouses, etc.—St. Patricks Church Society of Corning v. Heermans (N. Y.), 124 N. Y. S. 705.

Torts—Liability.—A city when acting in its private capacity as distinguished from its public functions is liable the same as a private corporation or individual for wrongful acts of its agents and employes while acting within the apparent scope of their authority.—Provine v. City of Seattle et al. (Wash.), 110 P. 619.

Grading Streets—Liability of City.—To hold a city for injury caused by street grading contractors in placing an extra fill on an adjoining lot, plaintiff need not show that the city expressly directed the contractors to make the extra fill; it being sufficient to show that the work was the ctiy's undertaking, and that in its course his injury was inflicted by persons in charge, in the absence of a showing by the city that the contractors were independent contractors.—Provine v. City of Seattle et al. (Wash.), 110 P. 619.

Federal Courts—Jurisdiction—Federal Question.—A muncipal ordinance legislative in character, in the exercise of delegated authority to make laws which the Legislature might have made, has the force of a state law within the contract clause of the Constitution, and, where such ordinance impairs the obligation of a prior contract made by the city, a suit to enjoin its enforcement involves a question arising under the Constitution of the United States, of which the federal courts have jurisdiction, where the requisite amount is involved, without regard to the citizenship of the parties. —Nelson v. City of Murfreesboro et al. (Tenn.), 179 F. 905.

Municipal Corporations — Powers — Lighting Contracts.—Murfreesboro city charter gives the city council authority to license, tax and regulate all business and corporations lawful to be carried on within the city. Subsection 11 gives the city complete control over the city streets, and subsection 13 gives power to provide for the erection of lamp posts, lamps, electric fixtures, and lamps for the lighting thereof, for strictly municipal purposes. Section 12 provides that no order or ordinance shall be made involving the expenditure of money or the contraction of a debt against the corporation unless money shall be [illegible] the city treasury to pay such debt or expenditure, or the same shall be within the amount of the current year's taxes for such purposes. Section 12 was amended by Laws 1905, c, 41, declaring that the provisions of section 12 should not apply to contracts made by the city council for the furnishing of lights for the city streets, and that the council should have power to make all necessary and proper contracts with any individual or corporation for the lighting of the streets for any period not longer than 10 years, and to make appropriations annually for such purposes. *Held,* that the amendment was not intended to enlarge the power of the city council so as to permit it to give a franchise generally in the ctiy streets in reference to any matter distinct from that of street lighting, but that its primary purpose was to do away with the original limitation upon the council's power so as to permit it to make such contracts for 10 years and appropriate money therefor, and the section does not confer the power to incorporate in such contract, under the guise of an additional consideration to the contractor, an exclusive franchise permitting the furnishing of electricity to the inhabitants of the city for lighting, heating, and power during the term of the contract.—Nelson v. City of Murfreesboro et al. (Tenn.), 179 F. 905.

Implied Powers—Exclusive Privileges in Streets.—A municipal corporation has no general implied power to grant exclusive privileges in the streets, such power not existing unless given by the Legislature in express language or necessarily implied from other powers, and, if inferred from other powers, it is not enough that the authority be convenient to them, but it must be indispensable.—Nelson v. City of Murfreesboro et al. (Tenn.), 179 F. 905.

WATER AND LIGHT

Detroit Water Supply—Chattanooga Water—Concrete Water Towers—Slot Machine Lights—Chicago Lights

Attack on Detroit's Water Supply.

A special commission appointed by the American Medical Association has stated that the excess of typhoid in Detroit is probably due to an impure water supply. The report states the case in part as follows:

Conners creek flows through a large cemetery and receives the drainage from a part of Fairview. The situation thus created seems to have been a cause of anxiety to some of the Detroit authorities for a long period. In the discussion of the 1892 epidemic it is stated that as a rule the water of Conners creek does not mix sufficiently with the main current of the river to reach the intakes, but flows past nearer shore. Even if this is the case, however, there is certainly danger from this source when an intake pipe nearer shore is used, as seems sometimes to be the case. There is some evidence, furthermore, that the water at the main intake crib may be affected. One observer is on record as follows: "When there is a flood in Conners creek basin the foul waters of the creek can be readily seen all the way from its mouth in the river to the opening of the city sewers. It is not unusual after heavy rainfalls and consequent floods of the creek basin to find the city water as drawn from the house faucets contaminated with quantities of organic matter."

A recent visit to Conners creek shows that the stream at the present time is heavily laden with sewage. A hundred yards south of Jefferson avenue, near the large manufacturing establishment of the Chalmers Motor Company, the conditions are substantially those of an open sewer. Grease and paper float on the surface and the bubbles of gas which are rising to the surface testify to the active decomposition of organic matter taking place on the bed of the stream. The current is in most places exceedingly sluggish, but rapid flushing out may occur after heavy rains. An examination of the water at its mouth was made, and showed, respectively, 12 and 14 organisms of the bacillus coli group in each of two o. 1 c.c. samples.

The recent growth of population in the vicinity of Conners creek naturally increases the danger of specific infection entering the water. The gravity of the situation has been clearly recognized by the present health officer of Detroit, Dr. Guy L. Kiefer. In the 1906-7 report the statement occurs that Detroit is "reaching a death rate which will soon cast suspicion on our water supply." In the same report an appropriation is urged sufficient to carry the sewage of Fairview to a point in the river beyond the intake of Detroit's water supply.

1. The general typhoid death rate for the city is higher than would reasonably be expected in a city situated as is Detroit, but with a pure water supply.

2. The typhoid rate in the city has risen in recent years, corresponding with the growth of population in the environs of the city, and the consequent increased pollution entering directly above the water intake. This increase in typhoid fever has occurred during a period when the disease has been decreasing in the country at large.

3. The deaths from typhoid fever tabulated by months show not only the general autumnal increase, but also season irregularities that indicate water-borne infection.

4. The annual death rates show marked fluctuations, far greater than would be expected in a city of this size if the water supply were not exposed to irregular pollution.

5. One extensive epidemic of typhoid fever in Detroit (1892) has been definitely traced to the public water supply. The source of supply is now no better protected against occasional contamination than it was eighteen years ago; as a matter of fact, the danger from near-by infection (Conners creek) is considerably greater.

6. The character of the watershed, with its considerable population draining into Lake St. Clair, the fact that large boats sometimes pass close to the intake crib, the existence of a small stream that discharges raw sewage a few hundred yards from the intake, demonstrate the possibility of occasional water infection.

Health Commissioner Kiefer denies the general statements of this report, and attributes the typhoid to the milk supply rather than to polluted water.

Chattanooga Water Works Report.

Mr. Walter G. Kirkpatrick, who was retained by the city of Chattanooga, Tenn., has recently offered a report covering the cost of a system to supply a quantity of water one-half greater than the present plant. The proposed system is to be municipally owned and a bond issue of $900,000 is at the disposal of the city for that purpose. The design of Mr. Kirkpatrick will require $1,552,-220, and is based on a system consisting of a river intake about eight miles up the river, with duplicate mains, except that leading to the intake, and with an emergency intake near the city, to provide against trouble in the case of a break. The estimate of cost is given briefly, as follows:

Contract A B, pumping and electrical machinery	$152,835
Contract C, boilers.....	11,928
Contract D, traveling cranes, main pumping station and intake pumping station.....	5,600
Contract E, freight elevator, head house	3,000
Contract F, tanks and standpipe for high level service..	9,115
Contract G, cast iron pipe: Distribution system, 127.3 miles mains..$379,230	

Raw water conduit..	55,570	
In buildings and grounds	23,491	
		468,291
Contract H, fire hydrants		27,800
Contract I, valves, distribution system.	11,332	
In reservoirs, buildings and grounds...	14,245	
		25,577
Contract J, sluice gates		18,964
Contract K, iron castings		170
Contract L. Concrete con. and gen. installation:		
In main pumping station	17,676	
At intake pumping station	22,790	
In filter and filter building	11,268	
In head house.....	13,698	
In coagulating and settling basins	54,842	
In storage reservoir...	90,680	
In clear water basin..	13,148	
In wash water tank and pavilion ..'....	1,982	
In grounds at purification plant	12,296	
At sub-stations	10,800	
		249,180
Contract M. Building, superstructures:		
Main pumping station.	27,300	
Intake pumping station	6,610	
Filter building	12,879	
Head house	6,495	
Gate house	300	
Pavilion and wash water tank	988	
Lookout Mountain substation	2,250	
Hill City, Missionary Ridge and Cameron Hill sub-stations ...	3,750	
		60,572
Contract N. Chimney.		8,000
Contract O. Special filtration apparatus...		33,260
Contract P. Steam and exhaust pipe system		7,700
Contract Q. Electric Transmission Lines Intake	14,819	
Sub-stations	15,637	
		30,456
Contract R. Electric wiring and lighting		3,500
Contract S. Laying water pipe:		
Distribution system ..	271,682	
Raw water conduit ..	89,590	
		361,272
Land and right-of-way		45,000
Total		$1,522,220

The present waterworks is owned by the City Water Co. and its purchase at a cost of $1,750,000 has been under consideration for over a year. In comparing the proposed plant with the one now in use Mr. Kirkpatrick stated that he had provided for more mains and larger. He places 1,357 fire hydrants against only 284 in use at the present time. These two facts will result in a greater degree of safety from fire loss and bring about a decrease in insurance rates.

The pumping engines of the City Water Co. have a capacity of 23,000 gallons, while the new plant will exceed this by 7,000. The clear water reservoir now in use has a capacity of 1,250,000 against one of 38,500,000 for the proposed plant.

In view of the difference between the estimated cost of the new system and the money available for its construction Mr. Kirkpatrick has been asked to modify his estimate, cutting out all the items that can be eliminated and basing his computation on a future population of one and one-half times instead of twice the present population of Chattanooga, as in the recent report. The new estimate will be within the $900,000 limit if it can be made so without radical changes in the main principles of the design.

Artistic Concrete Water Towers and Chimneys.

BY H. PRIME KIEFFER, C. E., NEW YORK.

This article deals with a distinctly new type of chimneys and water towers which has met with great favor abroad and is now being introduced into this country. The distinctive feature of this new system is that concrete blocks are employed throughout. By their aid the water towers and chimneys present a much more pleasing appearance than the wooden or steel towers or the brick chimneys.

In the United States there have been in use some twenty different systems in which armored concrete is employed, but they all have some primary form of scaffolding in their design and construction.

The new method of construction of which this article is a description is the invention of, and is controlled by, the contracting firm of Leon Monnoyer et Fils of Brussels, Belgium, which company also own and control all the patents issued in the principal countries of the world. The Rapid Chimney Construction Company of Room 1682, 50 Church Street, New York, are the American representatives of this system. The constructions are interesting because of their simplicity, their beauty of form, because of their economy in cost and adaptability to rapid construction.

The chimneys built under this system are composed of three parts, the foundation, the base and the shaft. The shaft is formed of reinforced concrete blocks of a peculiar and special design.

The number of blocks in each course always remains the same, yet there is a taper to the chimney. They are placed in regular horizontal courses to the required height and upon the top is placed a special capping block of either concrete, cast iron or cut stone. The workmen work on a rough platform and from the interior of the structure and each block is received by them ready for its particular position. Two men are usually employed above in laying and two below to hoist them to the platform. The blocks are lifted up the interior by an ordinary block and tackle hoist. The blocks in each succeeding course are placed in the opposite direction. That is

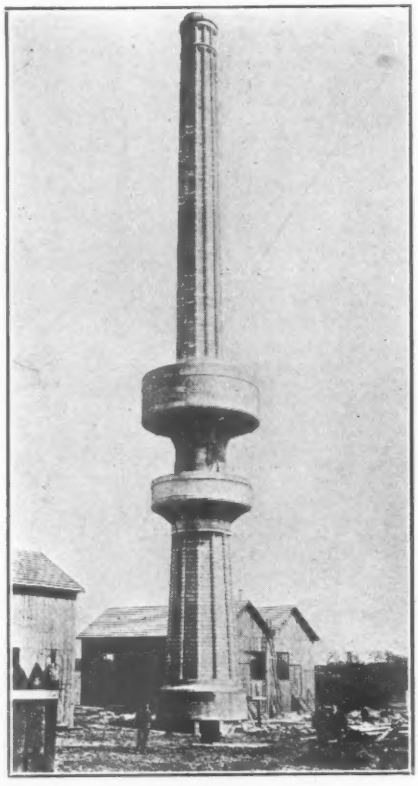
to say, all the even courses will have the same direction and all the odd courses will take the reverse of this. In this manner, the joining of the blocks of one course, where they do not meet perfectly, will be covered by the blocks in the courses above.

CONCRETE BLOCK WATER TOWER AT INTERNATIONAL EXPOSITION, BRUSSELS, BELGIUM.

Each block has at one of its extremities, a "hook" similar to the shape of the letter "U." This "hook" forms a hollow space which extends the full length of the chimney, and of course, there will be just so many of these hollow spaces as there are sides to the chimney. Through these vertical hollow spaces are placed around the iron rods, varying in diameter according to the height of the structure. At each course these rods are tied or bound to the courses by U-shaped flat pieces of iron. These in turn, are wired to a small iron rod which is placed between the courses horizontally and in a groove made for it in the top of the block.

The placing of the vertical rods in the openings and not in the substance of the shaft proper, forms an important advantage of this system. The reinforcement is thus kept at a low temperature, and is not subject to the injurious effects which would arise from unequal expansion if the steel was in the center of the mass. Ferro-concrete is indestructible by fire, so long as the temperature of decomposition of concrete is not reached, but it must be remembered that although the co-efficients of expansion of cement and iron are the same, the co-efficients of conductibility are very different, and fracture is likely to arise if from this cause, the temperature of the iron exceeds that of the concrete. Consideration of this condition is especially important in the case of a structure which is heated on one side only, such as a chimney.

A very clever idea in connection with the design of the blocks is that there is need for only three, or at the most, four sizes of blocks for the average chimney



CONCRETE BLOCK CHIMNEY WITH TWO TWO REINFORCED CONCRETE RESERVOIRS.

of 150 feet in height and with a taper of one to three per cent. This is made possible by the following arrangement: The molds by which the blocks are made consist of but three cast iron plates, held

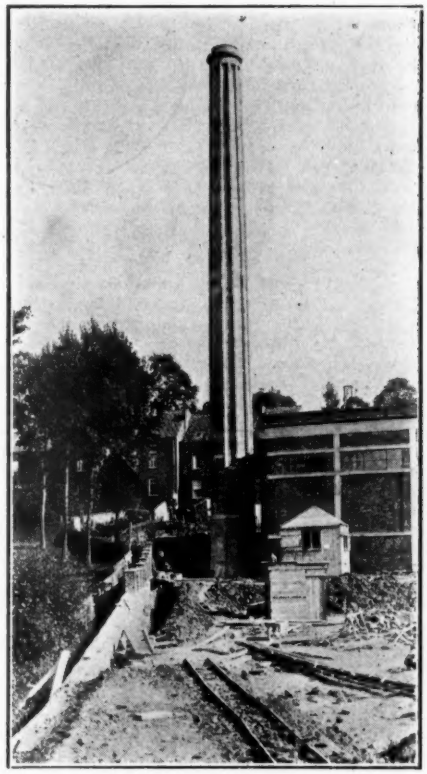
together by wooden stop blocks, and three ordinary iron clamps. Different sizes of blocks can be made, therefore, by simply changing the relative positions of the plates and the wooden stop blocks. After the blocks are molded, they are placed in the following manner: Take, for instance, the first row, which is of course placed on the base. Here naturally, the blocks are of the largest size, and the arm of the block the longest. The arms of the blocks in this course are placed just to the edge of the hooks of the blocks, and in the next course the arms are placed just a little farther into the hooks, and thus each succeeding course has a diameter smaller than the one below it, and in this manner, the taper of the chimney is obtained. As the longest blocks are some three feet in length and the distance across the semicircular opening about six to eight inches, it is possible to make a considerable taper in this manner. For a taper of one and one-half to two per cent., the size of the blocks is changed every 40 or 50 feet. The blocks may, of course, be laid with absolutely no taper, when the one size only of blocks is used. Some chimneys have been constructed on this plan but their appearance is not so graceful as those having a slight taper.

The concrete blocks are usually made at the chimney site, although this can be done at a concrete block factory, and this may be economical in case there are several chimneys under construction in the same district. The proportions for the concrete mixture vary somewhat, but the usual mixture consists of about five parts gravel, three of sand and two of cement. Dust of stone is used sometimes, and has given very good results.

From an architectural point of view, the chimneys constructed with this system present a pleasing appearance. Being thinner than brick chimneys, they rise more gracefully from their bases, and yet the strength and stability which they actually possess is at once suggested to the eye by the appearance of strength which is presented by the protruding rounded angles.

A number of chimneys and water towers have been built in Europe after this system, and the three photographs presented in connection with this article show a water tower, a combined water tower and chimney, and a chimney.

The water tower shown in the first photograph is located in Uccle, a suburb of Brussels, Belgium, and was used in connection with the 1910 Exposition held in that city. A general idea of the tower can readily be obtained by the photograph. It was built by Leon Monnoyer et Fils, concrete contractors of Brussels, who are the architects as well of the structure. The tower and tank have a height of 145 feet and the latter has a capacity of 280,000 gallons. The structure is circular and is built entirely of concrete blocks and without molding of any kind excepting that used in the building of the concrete reinforcing struts surrounding the base of the tank proper. The inside of the tank is built up in practically six stories, connected by a winding stairway. These different floors are divided into rooms, and these apartments, if they may be so called, were all occupied by engineers, foremen and other workmen during the Exposition. The stairways are placed along the outer



CONCRETE BLOCK CHIMNEY.

walls and the water remains in the center and enclosed by a concrete covering of rectangular cross sections. The tank has a concrete top, the center of which will rest on a continuation of the water mains or pipes. Excellent light is afforded the apartments by the large windows. The most interesting feature of the structure, aside from its artistic merit, is the manner in which is built up by the aid of the concrete blocks, previously described.

The second photograph shows a concrete block chimney with water tanks of reinforced concrete at Anderney, France. It is 180 feet high. The larger reservoir

has a capacity of 3,532 gallons, and the smaller of 777 gallons.

The third photograph shows a concrete block chimney.

When a municipality desires to build a water tower or a chimney connected with the same municipal building, they figure, of course, only upon the service which these structures are expected to perform and therefore the artistic side is almost wholly neglected in this country. However, in the case of these particular constructions there is no necessity for them not to use a simple and artistic structure, as the cost of such constructions with this system is materially less than any other permanent structure. It is just as easy to combine beauty and simplicity with cheapness as not. Of course it will be some time before the American municipalities are governed by men who are both business men and artists, but nevertheless it is well to look forward to the time when they will be governed by such men.

Slot Machine Lights.

The question is occasionally brought up by those sober-minded citizens who stay at home nights as to why they should be obliged to pay for lighting the homeward footsteps of the more convivially inclined. The justice of the common practice has perhaps never been actively assailed in this country, but from one town in Germany comes an item concerning an innovation which surely must have been caused by the protests of the sober-minded ones.

The village of Zarkau, near Glogau, in Silesia, has just installed an automatic "pay as you enter" street lighting system. The electric lights burn every night from the outskirts of Glogau through to the village of Zargau, a distance of about a kilometer, until 10 o'clock, at a mutual cost to the community in general. Then they are switched out.

At each end of this kilometer stretch, on an iron pillar, stands a small iron cupboard, lighted by a tiny electric light. Those persons who are out after 10 o'clock, wishing to have their way lighted, must insert a ten-pfennig piece into a slot in the side of the iron cupboard. Then the nine lamps placed along this stretch burst forth into a twelve-minute life, thus enabling the wayfarer to find his way in light.

The scheme is working in a satisfactory way, and it seems quite probable that other German villages and towns will follow the example of Zarkau and install the automatic lighting system.

Public Lights in Chicago.

At a meeting of the trustees of the Chicago sanitary district, on September 28, a contract was entered into providing for the lighting of the streets and public buildings of Chicago.

According to the contract, the sanitary district is to do more than merely furnish from the electrical energy developed by its water power at Lockport current for lighting the city. It is to take over the city's electrical stations and sub-stations, with their appliances and other electrical equipment, and make whatever additional installation may be necessary to the furnishing of light. The operation of the system for the life of the contract, seven years, will be in the hands of the sanitary district authorities.

The city has in operation at the present time approximately 12,200 arc lamps. The number is to be increased as speedily as possible by the addition of 10,000 lamps. Thus the public lighting facilities will be nearly doubled. For this service the city is to pay the district yearly $15 a horse power for electrical energy used, and, in addition, $1 a year as operating charges for every arc light of 450 watts capacity. The capital expenditures by the district are to be repaid by the city during the period, so that at its expiration the city will be in a position to resume operation of the lighting system, merely purchasing current from the sanitary district.

In the report submitted to the city council, Alderman Foell, chairman of the finance committee, stated that after the rehabilitation of equipment and the addition of 10,000 lights the cash cost of operating the 22,200 city lamps will be less than the cost of operating the present system of 12,200 lamps. After allowing for interest and depreciation on the present as well as on the future investment, the cost of operating and maintaining the enlarged system will be only 17 per cent. in excess of the present cost of operating and maintaining the 12,200 lamps.

This contract will secure great advantages for the city and is quite in contrast with the condition at Buffalo, where no benefits are derived by the city from the enormous Niagara Falls power development.

PAVING

Paving Brick Plant—Road Binding Materials—Licensed Contractors

The Ohio Experiments on Road Binding Materials.

During the summer and fall of 1909 the State Highway Department of Ohio, in cooperation with the manufacturers of materials for treating roads built a series of experimental sections of road on Nelson avenue, a cross road on the outskirts of Columbus, O., the improvement being crossed by the Columbus, New Albany and Johnstown interurban, by which it is quickly reached from the city.

The details of construction, materials used, etc., are given in Bulletin No. 12 of the State Highway Department, issued in January, 1910. A supplemental report on the condition of the sections in September, 1910, is given in Bulletin No. 13. The writer inspected the road in July, 1910.

The first section was treated with Glutrin, described by the manufacturers as a "calcium-magnesium-ligno-sulfonate." A macadam road was sprinkled with water and then with the glutrin in two applications a day apart, one gallon to the square yard in all. Cost $560.78, or $453.99 not including Glutrin.

The road was hard but dusty in July, and, except for a bronwish discoloration, had the appearance of water-bound macadam in September. Apparently requires annual treatment with the glutrin.

The second section was treated with Standard asphalt binder of the Standard Oil Co. with the application of 1½ gallons per square yard to the rolled second course to which screenings were applied as required, a second treatment with ¼ to ½ gallon per square yard and more screenings. Cost $446.69 not including asphalt binder. The road had a hard surface, was only slightly dusty, although the oil only showed slightly in July. In September the asphalt had exuded so as to cover about half the surface and showed marks of horses' shoes.

The third section was treated with Pioneer asphalt cement of the American Asphaltum and Rubber Co., with the application of 1¾ gallons on the second course of macadam after about half the voids had been filled with screenings well broomed in. More screenings were spread on the cooled asphalt in advance of and along with the rolling until the coating was all absorbed. Cost, $663.26, or $586.02 not including Pioneer asphalt. In September the surface was smooth and in excellent condition, all pieces of stone being perfectly bound with no excess of binder.

The fourth section was treated with Tarvia X, of the Barrett Mfg. Co., with the application of the hot tar under pressure, 1¼ gallons per square yard on the second course of 1½ to 3-inch stone, and ½ to ¾ gallon after screenings had been rolled into the course of tarred large stone, on top of which a protecting coat of screenings well rolled. Cost $570.80, or $437.60 not including Tarvia X. The stones were well bound with no excess of tar, stones showing in spots. This section is somewhat dusty, doubtless from traffic from the cross road here.

The fifth section was treated with Tarvia B, of the Barrett Mfg. Co., applied on a macadam road filled and rolled dry and after two weeks travel over it, the dust and dirt being swept off, and 2-3 gallon per square yard sprinkled on warm enough to run freely, after which the sweepings were swept back over the surface. Cost $497.24, or $464.69 not including Tarvia B.

This had much the same appearance in July and September as the preceding section and had little or no dust.

The sixth section was treated with liquid asphalt of the Indian Refining Co., applied hot in the same manner as on Section 3. Cost $500.09 not including the liquid asphalt. The binding material showed but slightly on the surface in July and September, but the stones of the wearing surface were apparently held in place by the binder below, which was more viscid than usual in such fillers.

The seventh section was treated with Ugite, made from water-gas tar. Part of the area had 2.05 gallons per square yard poured hot on the top course after rolling ¾-inch stone into it, on which ¾-inch stone, then ½-inch chips and then ¼-inch screenings and dust, were rolled separately until firm. Part of the area had 1.67 gallons poured hot on the top course filled with the ¾-inch stone as above, the course of ¾-inch stone being then rolled in, on which 0.44 gallons of Ugite was poured, then the ½-inch chips were rolled in and later the ¾-inch screenings and dust. Cost $651.98, or $559.58 not including Ugite. There was no apparent difference between the two methods of application in July or September and the appearance and condition was very similar to Section 6.

The eighth section was treated with Fairfield asphaltic cement, applied hot on the second course of macadam after rolling, then applying ½ inch of stone chips which were thoroughly rolled. The quantity used on the 400 feet of road was 13,350 pounds of very heavy viscous as-

phalt. Cost $602.90, or $487.55 not including the asphalt. This section was in excellent condition in July and September, the surface slightly rougher than some of the tar-treated sections.

The ninth section was treated with asphaltoilene, applied hot in very nearly the same manner as Section 8. Cost $568.38, or $452.06 not including the asphaltoilene. The asphalt covered the surface in part in July and September, being dustless and acting much like a soft asphalt surface, but part of the wearing surface was the stone, held in place by the binder below.

The tenth section was Wadsworth macadam, being an inch of finely ground Kentucky rock asphalt applied to the top course of macadam, prepared as on Section 9, thoroughly rolled and an additional inch again rolled. It was applied in warm weather without heating. At the beginning the surface was tracked easily by wagons and marked badly by horses' shoes, but after some months it became like an asphalt surface and in July and September appeared to be an asphalt pavement and was in better condition than at the beginning. In July it showed marks of the recent passage of a traction engine. Cost $751.70, or $606.65 not including the asphalt.

The eleventh section was treated with Carbo-Via applied hot about the same as on Section 9, 1⅛ gallons per square yard from hand sprinkling cans at the first application, and the roller oiled with an emulsion of kerosene and water to prevent sticking, stone chips being then swept into the voids and again rolled, followed by ½ gallon of Carbo-Via again rolled, ¾ inch of stone screenings applied and again rolled. Cost $568.95, or $460.40 without the Carbo-Via. In July and September this section was quite similar to Section 4, except slightly rougher, although the thick coating of screenings on top had made it quite dusty during its early life.

The twelfth section was a concrete macadam, made the same as water-bound macadam, except that Portland cement was mixed with the screenings for the binder of the top course one of cement to six of screenings, which were then applied dry and water applied until a wave of grout appeared ahead of the roller all over the surface. The section was closed to travel and kept damp by sprinkling for several days. Fifteen barrels of cement was used on the 400-foot section. In July the stones projected, making a noisy pavement, and the surface appearance is reported to have been from the beginning similar to water-bound macadam. Cost $481.44, or $464.34 not including the cement.

The thirteenth section was treated with Taroid of the F. J. Lewis Mfg. Co. The lower course was of rather small stone filled and rolled. The second course was of 1½ to 3½-inch stone 3 inches deep, treated as in Section 3 with 1 to 1½ gallons per square yard, done by hand, and rolled when partly cooled. Coarse sand was then rolled in. Cost $596.70, or $503.49 without the Taroid. This had good surface, showing some stones, and evidences of excess of tar at the sides where it has run out over the adjoining ground surface.

The fourteenth section was Petrolithic pavement, laid according to the specifications of the inventor. Cost $622.60. The asphalt exuded when the heat of summer began so that travel avoided the road. It was repaired by adding 2 inches of screened gravel, which was well rolled in, the repair, except rolling, costing $50.15. Only gravel showed on the surface in July and in September the road was rutted by vehicles, gravel showing outside the line of ruts.

The fifteenth section was limestone concrete, 1 cement, 3 screenings, 6 stone, machine mixed with little water. Slow rolling resulted in wavy surface. Depth, 6 inches with several vertical transverse joints. Cost $668.69. This section showed few cracks and some indentations in July. In September some of the junctions of days' work showed wear. About half the section was in very good condition and the other half not so good.

The sixteenth section was gravel concrete, 1 barrel of cement per cubic yard, mixed wet, placed 6 inches thick and formed by dragging a template over it. No joints, so slab is 6 inches thick, 16 feet wide, 400 feet long. Some transverse cracks like joints and a few other cracks showed in July and the surface was smooth. There was little sign of wear in September and the surface afforded good footing for horses. Dustless, and transverse cracks did not show wear. Cost $507.90.

The seventeenth section was ordinary water-bound macadam. In July the surface binder had been removed in part, showing the stones, and a few ruts had appeared. In September the surface had still further disappeared, but the condition was still considered satisfactory.

The measured wear on the center line varied from 0 for the glutrin and gravel concrete to 0.07 foot for the Carbo-Via, being the averages of five stations. The maximum wear shown was 0.09 feet near one of the outside edges of the Standard asphalt section, also the average of five stations.

Hammond Contractors Licensed.

An ordinance has been passed by the City of Hammond, Ind., providing for the licensing of contractors engaged in sidewalk work. This ordinance contains some novel features which may be stated briefly as follows:

Any person, firm or corporation desiring a license to engage in the business of constructing and building sidewalks for other people under contract within the

city of Hammond shall make application, in writing, for such license to the Board of Public Works, setting out in such application the full name and residence of the applicant. Such applicant shall file with Board of Public Works a bond with sureties to be approved by the Board of city against any damages on account of Public Works in the sum of five thousand dollars for the purpose of indemnifying the city against any damages on account of accidents during the construction of a sidewalk built by the person procuring such license and conditioned further that the licensee shall repair and replace any defective sidewalk for a period of three years from the time of completion of any such sidewalk constructed by said licensee after written notice. The bond shall not have less than two free holder sureties, or some approved surety company, all to the approval of the Board of Public Works. Upon the approval of the bond the Board of Public Works shall approve the application for such license by endorsing their written approval thereon in writing and the city controller shall thereupon issue to the applicant an annual license to engage in the business of constructing and building sidewalks upon the payment by the applicant to the city treasurer the annual license fee in the sum of twenty-five dollars.

Further provision is made that on condition of a defective sidewalk requiring repairs, the contractor shall be notified and given 15 days' written notice to repair the damage. In event of failure to do as requested the work shall be let to some other party and the expense shall be charged against the bond and the licensee shall be suspended from receiving further permits or doing any further work until the expenses shall have been taken care of.

An Up-to-Date Brick Plant.

The United Brick Company of Conneaut, Ohio, was one of the first plants to adopt the Dunn system of Wire Cut Lug Brick and their method of handling the process might be found interesting.

The institution has a capacity for making thirty thousand bricks in a ten-hour day. There are seventeen circular kilns, sixteen of which have a capacity of thirty-five thousand bricks each. The other is rectangular and has a capacity of one hundred thousand, and these are being run to their full capacity all the time. The pressure from the trade is such, however, as to make additional facilities necessary, and at an early date larger kilns of the rectangular type will be constructed. The output of the brick plant, running a ten-hour day, is about a million brick a month.

The process of manufacturing brick at this plant is interesting. The blue shale rock is hauled up from the clay pit on an inclined tram. A syphon pump keeps the pit dry. At the top of the tramway the shale is dumped from cars into a bin, and the shale is fed through a spout into two crushers, each with a capacity of seventy-five tons per day. Under the crusher revolves a bed plate, the periphery of which is a screen. The centrifugal motion of the plate throws the crushed shale upon the screen, and the finer particles sift through. The coarser particles are again thrown upon the crusher. The screened shale is taken up by a bucket to the top of a building, and is again screened. The coarser grains are returned by gravity to the crusher, through which they again pass. The weight of each crusher is sixteen tons.

After the final grinding and screening the shale goes into a bin and thence into a pug mill or tempering machine, which mixes the shale with the water to the proper consistency. The tempered shale or clay is then conveyed automatically to the auger machine. The auger or propeller forces the clay through a die in a column the thickness of a brick; the width of the column representing the length of the brick; an endless belt carries this column horizontally to the cutting machine, the weight and adhesion of the column carried along by the machinery causing the belt to revolve.

In the process of cutting the clay into brick, a frame is automatically lowered immediately prior to the wires entering the clay, and raised immediately thereafter, thus clamping the clay during the cutting operation, yet releasing it while it is in motion over the platen. This clamping feature prevents the clay moving on the platen during the cutting operation, and this makes crooked cuts impossible.

Round edges of any desired radius are obtained by making plates with flanges which indent the clay when it is clamped between them. Any configuration placed on the plates will leave its imprint on the brick. This makes it possible to place any desired design on the surface of the brick. Ordinary branding of the brick with the manufacturer's brand is accomplished by rolling the design on the clay column, the size of the brand being small enough to insure getting one on each brick.

To make brick with lugs, the slots in upper and lower platens are made with off-sets therein at any desired point. Therefore, the wires being deflected by these off-sets, leave ribs or lugs across the one face of the brick and corresponding grooves in the adjoining brick. The clay column being protected and held firmly by plates with slots or spaces between the plates only large enough for the free passage of the wires, makes it possible to cut as true, clean edges as can be obtained by repressing, and this, too, with a reciprocating movement of the wires.

When the bricks leave the cutting machine and are carried forward, all excess clay and such of the bricks as

may be carried past the car, drop into a bin and are automatically conveyed back to the auger machine. In fact, almost all the work of transporting materials is done automatically.

After they are cut into bricks, the blocks are carried forward on a belt, from which they are taken and placed on a car and pushed into a drying tunnel. There are ten of these tunnels, each holding eleven cars. The tunnels are heated by means of the waste heat from the kilns, the heat being drawn by a fan through the underground passages to the tunnels by a 35 h. p. engine.

From the drying tunnels the blocks go to the kilns and are exposed for 12 days to heat which attains 1900 degrees temperature.

ORGANIZATIONS AND INDIVIDUALS

Good Roads Convention—American Society of Engineering Contractors—Technical Meetings—Technical Schools—Civil Service—Personal Notes

The Southern Appalachian Good Roads Convention.

One of the features of the Appalachian Exposition, held in Knoxville, Tenn., during the first days of October, was a good roads convention which attracted a wide interest. The organization is only about one year old, but a great deal of good has been accomplished in its comparatively short existence and its membership includes the governors of Tennessee, Kentucky and South Carolina. Mr. Joseph Hyde Pratt is president.

Among the paper of interest to our readers, the following were perhaps the most important:

"Convict Labor in North Carolina," by W. L. Spoon, highway engineer, North Carolina.

"Top-soil Method of Road Construction used in Clark county, Georgia," by C. M. Strahan, professor of civil engineering, University of Georgia.

"Road Legislation and the Automobile as a Factor in the Good Roads Movement," by Henry R. Brown, of Tennessee.

"Speed Limits of Automobiles on Public Roads," by George C. Diehl, Buffalo, N. Y.

"To What Extent Do Automobiles Destroy Our Roads," by L. W. Page, director office of good roads, Washington.

A general educational bureau was conducted by the government with lectures and an exhibit.

The exhibit consisted of a number of models built on a scale of 1 1-2 inches to the foot and illustrating fifteen standard types of roads in use in various parts of the United States. One of the most important features of the exhibit is that which showed the use of asphaltic oil and tar as dust palliatives and preventives, and for the preservation of macadam roads.

A miniature crushing plant and steam roller in actual operation as well as a complete outfit of earth handling machinery were also shown.

The following is a brief description of the model roads:

The model earth road illustrated a section of poorly drained earth road; a section which is well drained and crowned with a road machine; another on which the ruts and holes are being filled with a split log drag.

The oiled earth model showed a section of dusty roads; same road plowed, harrowed and ready for oiling; asphaltic oil spread on plowed surface; mixing oil and earth; finished road.

The sand clay model was that of a section of on old sandy road; same rounded up ready for clay; 6 or 8 inches of clay spread on; mixing clay with disk or tooth harrow when wet; finished road after being shaped with road machine.

The gravel road model showed prepared subgrade and gravel shoulders; first course of gravel spread and rolled; second course of cementing gravel and finished road.

Gravel macadam model included the prepared subgrade with earth shoulder as in regular macadam road with shoulder drains; first course gravel; second course of cementing gravel; and finished road.

Telford model showed prepared subgrade and earth shoulders. Telford base of rock laid by hand; layer number one of crushed rock; layer number two of crushed rock; coating of binder; screening and dust; finished road.

Macadam road included the subgrade with shoulders of earth and shoulder

drains; number one course of 2 to 2 1-2 inch rock placed to a depth of from 6 to 8 inches rolled; number two course of 1 to 1 1-2 inch rock rolled to a depth of from two to four inches.

The tar macadam road model showed dusty macadam surface; same swept and cleared; hot bitumen broomed into the surface; sand and stone screenings spread to take up surplus bitumen. Sections of tar macadam roads built in Washington, D. C., in 1872-3-5-7 are also shown to illustrate the life of this class of construction.

Other types were illustrated in a similarly complete manner and full descriptions of each type of road were available. In setting forth the method of construction of three various kinds of roads, tiny models of road machinery, crushing plants, quarries, etc., were shown in operation.

This valuable exhibit together with the papers which are mentioned elsewhere in this issue serve as indications of the value of the convention.

The American Society of Engineering Contractors.

The Annual Convention of the American Society of Engineering Contractors was held in the Coliseum at St. Louis September 26th to 28th, inclusive. The meeting was well attended considering the fact that it was held during a time when most engineering contractors are busily engaged in rushing their jobs to completion before the winter season. The enthusiasm and earnestness of those present in a measure was a compensation, and a great deal was accomplished along the lines for which the society was organized.

Two of the papers presented at the convention were given in the October issue of MUNICIPAL ENGINEERING. A third paper, by Edward Wegmann and J. B. Goldsboroug,h of New York City, on "The Construction of the New Croton Dam" was one of the most interesting papers of the session. It was accompanied by many stereopticon views, necessary to the full appreciation of the paper.

During the convention an inspection trip was made to "The Chain of Rocks," where St. Louis' great water supply is treated with lime and iron to cause sedimentation. This trip was made particularly interesting from the discussions by men who had been connected with the water supply problems of other cities; notably Mr. Edward Wegmann, who was connected with the water department of New York City for a number of years.

The Engineers' Club of the City of St. Louis was prominent in the success of the convention, and to them and the local committee is due great credit for the success of the meeting.

Technical Meetings.

The seventh annual convention of the National Association of Cement Users will be held in the Concert Hall of Madison Square Garden, New York City, December 12 to 23.

The annual meeting of the American Roadbuilders' Association will be held in Indianapolis, December 6, 7, 8 and 9.

The thirteenth annual convention of the League of California Municipalities will be held at San Diego, November 15, 16, 17, 18 and 19. The program in part will be as follows: "A Discussion of the Commission Plan of Government," led by Commissioner A. E. Dodson, of San Diego, followed by Mayor Beverly L. Hodghead, of Berkeley, and others. "City Planning," by Dana W. Bartlett, of Los Angeles, illustrated with stereopticon views. "Sanitary Conditions in California Cities," by Dr. W. F. Snow, of the State Board of Health, illustrated with stereopticon views taken from cities and towns in different parts of the state. "Conservation of Municipal Water Front," by Stephen G. Long, city attorney of Long Beach. "Assessor's Duties," illustrated with records, forms and maps, by D. D. Kellogg, assessor of Pasadena. "Cement and Cement Testing," by William B. Gester, of the Robert W. Hunt & Co., one of the largest engineering firms in the world. "Standard Specifications for Oil Macadam Pavement," illustrated with steropticon views taken from different parts of the state, by Engineers S. J. Van Ornum, of Pasadena, and Orlin Hudson, of Richmond. "Suggested Modifications of the Vrooman Act," by Hugh R. Osborn, city attorney of Santa Cruz. "The Fly Evil" and "The Impure Milk Evil," by speakers from the state board of health, illustrated with two reels of moving pictures, secured expressly for this convention. The rights of telephone companies to erect poles in the streets, the Warren Bros. patent pavement, the Cameron septic tank litigation and modification of the Vrooman act will be special subjects to be taken up by the city attorneys present.

The annual meeting of the New Jersey Sanitary Association wil be held at Lakewood, N. J., December 2 and 3. J. A. Exton, secy., 75 Beech st., Arlington, N. J.

The annual meeting of the American Society of Mechanical Engineers will be held at New York City, December 6, 7, 8 and 9. C. W. Rice, secy., 29 W. 39th st., New York City.

The annual convention of the Association of American Portland Cement Manufacturers will be held in New York City, December 12, 13 and 14. Percy H. Wilson, secy., Land Title bldg., Philadelphia.

A meeting of the American Institute of Electrical Engineering was held, Oct. 17, in the United Engineering Socities bldg., New York City. It was announced as a "public engineering meeting," to discuss

the rapid transit situation in New York City. A paper on "The New York Sanitary Situation" was presented by Frank J. Sprague, which was folowed by four or five invited speakers called upon for discussion.

The New York Cement Show will be held in Madison Square Garden December 14 to 20, 1910, and in connection therewith the National Association of Cement Users and the Association of American Portland Cement Manufacturers will hold their annual conventions.

The Chicago Cement Show will be held at the Coliseum February 17 to 23, 1911. Both the New York and Chicago shows are under the management of the Cement Products Exhibition Co.

The National Municipal League will hold its annual meeting in Buffalo, N. Y., November 14 to 18. An excellent programe is in preparation.

At the meeting of the Brooklyn Engineers' Club Oct. 13, Wm. T. Donnelly presented a paper on "The Electrification of the Works of the John N. Robins Co." The informal library talk on Oct. 20 by Snowden B. Redfield was on "The Air Compressor," and that of Nov. 3 by A. R. Maujer will be on "Chimneys."

A most unique feature of the meeting of the Illuminating Engineering Society at Baltimore, Md., was a series of lectures on illuminating engineering under the joint auspices of the society and Johns Hopkins University, by the experts in the field. There were three of these lectures each day, at 9, 11, and 2, beginning Oct. 26 and extending to Nov. 8.

Extensive preparations are in progress for the World's Congress and Exposition on Government of Cities to be held in Chicago Sept. 18 to 30, 1911.

The Munncipal Engineers of the City of New York listened to a paper on "The Pavement Problem in the Borough of Manhattan," by Geo. W. Tillson, chief engineer of highways, at its meeting Oct. 26.

The Technical Schools.

The July number of the Record of the University of Tennessee gives a full, well-illustrated description of the facilities for technical education in the institution, which is located at Knoxville, Tenn.

The extension division of the University of Wisconsin issues frequent bulletins giving material to prepare students for debating and public discussion. No. 379 is devoted to the commission plan of city government and gives the Wisconsin act on this subject in full.

The first bulletin of the Pennsylvania State College gives a statement of the purpose and work of the engineering experiment station and two papers on efficiency of incandescent lamps and construction of concrete floors.

Civil Service Examinations.

The U. S. Civil Service Commission will hold examinations at the usual places as follows:

Nov. 22, 23: For deck officer and similar vacancies, coast and geodetic survey, age 18 to 24, at $720 with rapid advancement.

Personal Notes.

Earnest Warbutton has resigned as city engineer at Crawfordsville, Ind.

C. P. Wells, of Aberdeen, S. D., has been appointed city engineer at Redfield, S. D.

Ernest McCullough, consulting engineer, specializing in municipal work, has moved his office to the Fisher bldg., Chicago.

Charles K. Mohler has established an office at 1839 McCormick bldg., Chicago, Ill., and will practice as consulting engineer.

David A. Hartwell, who has been city engineer of Fitchburg, Mass., for 20 years, has resigned to become chief engineer of the sewage disposal commission of that city.

F. W. Stevens and George F. Baker, Jr., have been elected directors of the Atlas Portland Cement Company, at Chicago, Ill., to succeed F. L. Hine and George F. Baker.

Prof. C. E. Freeman, electrical and mechanical engineer, and H. G. Raschbacher, irrigation engineer, have joined the Chicago staff of W. H. Rosecrans, consulting engineer.

S. D. Sarason has resigned as assistant in the U. S. Coast and Geodetic Survey, to accept a position as instructor in civil engineering at Syracuse University, Syracuse, N. Y.

Prof. Joseph B. Davis, associate dean of the civil engineering department of the University of Michigan, tendered his resignation Oct. 8, and was made professor emeritus of surveying by the board of university regents.

R. H. Gillespie, formerly chief engineer for the John J. Hart Company and the F. V. Smith Constructing Company, New York City, has been appointed chief engineer of sewers and highways, Borough of Bronx, New York City.

The Goldsborough Company has been organized in Denver, Col., to conduct a general engineerng and construction business in civil, hydraulic, electrical and mechanical lines. W. E. Goldsborough is president of the new company.

Major W. W. Harts, M. Am. Soc. C. E., of the U. S. Engineers Corps, has been awarded a Telford gold medal by the Instiution of Civil Engineers of Great Britain, for a paper submitted to that society and published in Transactions for 1909-10.

L. J. Towne, formerly with the bridge and building department of the Chicago, Milwaukee & St. Paul Railway at Chicago, has been appointed adjunct professor of civil engineering in the University of Nebraska, at Lincoln. He suceeds Prof. Alfred Boyd, who has gone to the University of Oklahoma.

William T. Reed, Elmer E. Tucker and E. F. Rockwood, formerly with the Eastern Expanded Metal Company and the Eastern Concrete Construction Company, Boston, Mass., recently organized the New England Concrete Construction Company, and are prepared to design and build concrete and reinforced concrete structures of all kinds. The company has established offices in the new Boston Safe Deposit & Trust Company building.

MACHINERY AND TRADE

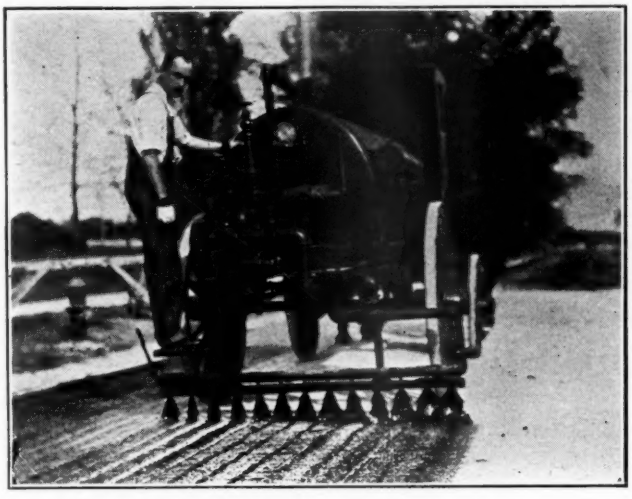
A Pressure Road Oil Machine.

During the recent Good Roads convention in St. Louis occurred the first practical demonstration of something entirely unique in the field of road treatment. The accompanying photograph, taken at that time, illustrates the demonstration mentioned.

A small 3 h. p. gasoline engine was attached to the rear of one of the ordinary type of the Standard Oil Co. road oil wagons. This engine operated a Gould pressure pump, delivering the road oil through the pipes as shown, to the outlet pipe, where a pressure of 25 lbs. is maintained. Connected to this outlet pipe are 13 jet nipples of such a shape as to spread the oil in the fan-like form as shown. By means of the lever shown attached to the outlet pipe, immediately beneath where the operator is standing, the quantity of oil flowing may be regulated to spread from ⅛ to ¼ of a gallon per square yard, or more if desired. In addition to the pressure pipes leading direct to the pump, there is an emergency pipe leading from the tank, so that the sprinkler may be used without the forced jet if desired.

The pressure sprinkler is designed to handle any kind or grade of road oil, no change being necessary to adopt it to the heavier oils. The tank to which it is attached is of a capacity from 600 to 700 gallons.

The demonstration on Lindell boulevard in St. Louis was made before a number of delegates to the Good Roads convention. The road selected was of water-bound macadam, which had been swept free from dust and dirt, leaving the surface as hard and nearly as impervious as concrete. As will be seen from the photograph the oil was spread evenly over the surface without leaving the pools and dry spots which seem unavoidable under the old sprinkler system. The pressure method of application seemed to incorporate the oil into the surface material almost at once, even under the unfavorable condition of an almost impervious road surface.



PRESSURE ROAD OIL TANK.

For further information relative to the machine, address the Road Oil Department of the Standard Oil Co., New York City.

Ceresit.

"The Efficient Economical Waterproofing" is a small booklet advocating the use of ceresit waterproofing. Examples of the use of the compound, arguments in its favor and directions for its use are given. The most noteworthy examples of its use, given, are in Ger-

many, the Ramholz and Ruppertsberg tunnels being the most prominent. A leaflet of testimonials and one of specifications accompanies the booklet.

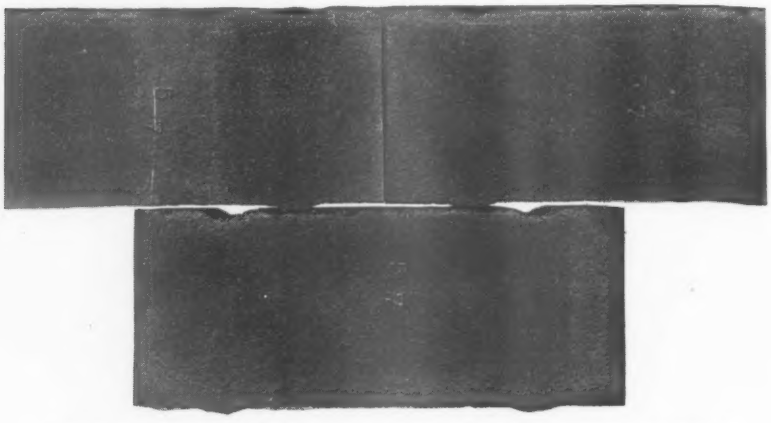
Wire Cut Lug Blocks.

With the advancement in paving construction, which has come through the understanding of the right use of brick paving fillers, there has been a decided step forward in the manufacture of brick. The necessity for providing some means of holding the brick apart to allow the filler to penetrate between them has long been recognized and the method of repressing has been, so far, the only means of obtaining lugs or ridges to provide the space desired. Mr. Frank Dunn has an invention which gives the desired results without the bad features of repressing.

The invention consists of guides, either rigid or in the form of rolls, attached to the platen of the cutting table and projecting over the line of travel of each wire as it passes through the clay column, thus deflecting the wire and forming a rib or lug across the face, or rather the side of a side-cut brick. This also makes a corresponding groove in the adjoining brick, but the groove can be easily removed by attaching extra wires to cut off sufficient clay, which will immediately return to the auger machine over the waste clay conveyor. The groove, however, is generally considered an advantage to the brick, as it admits the filler more freely. Photograph No. 1 shows the effect of the wire cutting lugs in separating the blocks for the bonding material.

Engineers have for years past specified repressed brick or blocks, as this was the only paving material that by reason of the lugs formed in repressing, could insure as much as possible the admission of the filler between the bricks, in order that a bond might be obtained, which would not only make the pavement more rigid, but water-proof also. The accompanying photograph No. 2 shows a case in which an effort was made to break the bond between wire cut lug brick with the result that the brick themselves were broken and the bond was not injured. With the square corners and the ample provision for the admission of a good cement filler, the wire cut lug brick will give a smooth lasting and perfectly waterproof pavement.

Photograph No. 3 shows the simplicity and ease with which the brick may be laid in place, the regularity of the lugs and their accuracy of cutting assuring against irregularity and varying joints. The joints obtained are of uniform width and in straight lines, as is shown in photograph No. 4. This assures the rapid and complete filling of all joints and a smoothness of surface, almost impossible of attainment with irregular joints.



1. SHOWING AMPLE SPACE FOR FILLER WITH WIRE-CUT LUG BRICK.

The one great advantage of the round cornered brick has been to the manufacturers' credit rather than an advantage to the pavement. It has been shown that the round cornered brick do not lose as much under the abrasion test as those having square corners. In spite of this fact samples of wire cut lug block submitted to the Ohio State University laboratories and to the testing laboratory of the Highway Department of Ohio show a surprisingly low percentage of loss. Under the standard tests the average percentage loss for the Ohio State University samples was 19.05, while the loss for the samples submitted to the state laboratory was 18.65.

There now remains one step necessary for the general adoption of the wire cut lug block. Most cities provide in

2. SHOWING STRENGTH OF BOND OF WIRE-CUT LUG BRICKS.

3. LAYING WIRE-CUT LUG BRICKS.

4. WIRE-CUT LUG BRICK PAVEMENT READY FOR FILLER.

their specifications that repressed brick must be furnished on all contracts. Fifty-two cities have already admitted the wire cut lug blocks to their specifications, and more are intending to do so. When this has been done, manufacturers will be ready, and in fact will prefer to adopt the more advanced type of mrick. The answer is evident. The merits of the wire cut lug block should be investigated and if all that is claimed for it is true it should be at once admitted under the specifications of every city. Full information will be furnished on application to The Dunn Wire Cut Lug Brick Co., of Conneaut, Ohio.

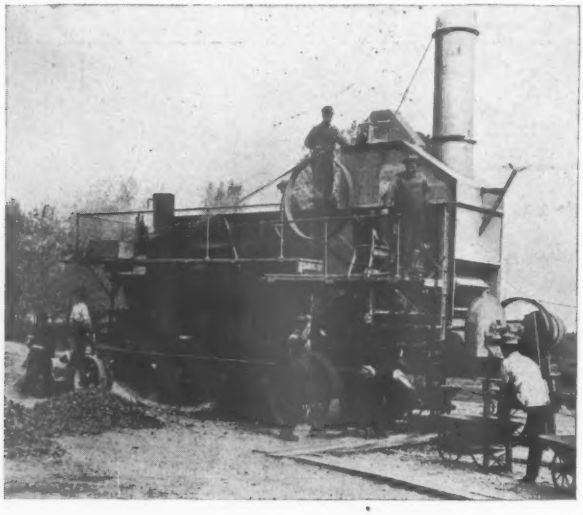
A Portable Asphalt Plant.

Considerable difficulty is encountered under the common method of laying asphalt macadam due to the irregularity in hauling material from the plant. Even under the most careful management there are delays caused by waiting on wagons to come from the plant and the matter of keeping the gang alternately resting and rushing is never good economy.

In addition to this labor difficulty there are certain conditions of temperature and mixing that must be met in order to assure a good asphalt macadam pavement. The binder must be heated to a point which will make it perfectly liquid, without danger of "flashing" or burning; the aggregate must be dry and heated to a temperature to match the binder; the exact proportion of the aggregate and binder, to produce the best results, must be rigidly maintained by automatic measuring devices; the aggregate and binder must be thoroughly mixed and delivered fresh to the roadway at the proper temperature without danger of being chilled or separated by a long haul from a semi-permanent plant. All these essentials are furnished by the Twentieth Century Portable Asphalt Paving Plant, which is operated with a minimum crew directly in connection with the raking and rolling.

The general view shows the standard machine, which is about 27 feet long, mounted on broad-tired wheels, and moved along ahead of the work at convenient intervals by a traction engine or road roller.

The aggregate is shoveled into a hopper at the front end of the machine to be fed into the heating and drying drum, which is about 12 feet long and revolves directly over the fires. One end of the drum is seen extending through the casing and receiving the blast of hot gases, which the fan draws from the rear of the furnace and blows directly through the interior of the drum. In the detail view the lever man has dumped into the mixer a batch of hot aggregate from the measuring box, and melted asphalt from the measuring drum, and the mixer man is preparing to open the slide at the bottom of the mixer to deliver a load into the barrow. In this view of the rear of the machine will be seen the main shaft and driving connections to various parts of the machinery, and the casing which encloses the elevator, storage hopper, measuring devices, mixer, etc.



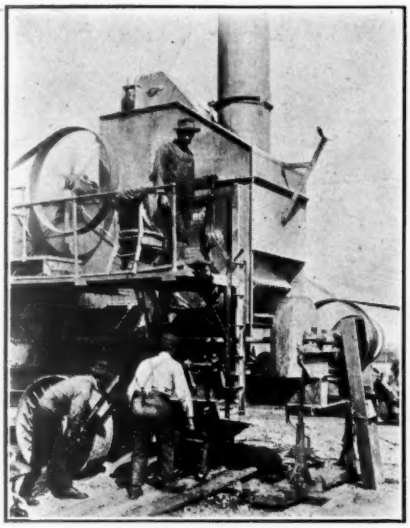
LINK-BELT CO.'S PORTABLE ASPHALT PLANT.

The average capacity of the plant under normal conditions is conservatively rated at 300 square yards of 2-inch thick paving per day of nine hours, which means about 170 to 175 dumps of the measuring box. The records of one of the machines at work in a Chicago park show an average of over 200 boxes per nine-hour day

for a month, sometimes running to 275 boxes per day. Two machines used by the South Park Board in Chicago laid about 160,000 square yards in 1909, starting in June.

One of the early pavements laid by this machine is on Michigan avenue, Chicago, between 39th and 55th streets. This has had over 500 days of heavy automobile traffic without a cent for repairs, having passed through two hot summers, and an unusually severe winter, without ruts or cracks, presenting a firm but resilient surface, smooth but not slippery, and apparently in excellent condition.

The operation of the plant is continuous and the delivery of prepared material correspondingly regular. The discharge comes in batches at intervals of two or three minutes, and the asphaltic concrete mixture is delivered to the work in carts. In daily operation the machine sets the pace for the whole work, furnishing a steady supply of fresh paving mixture to the rakers and rollers, and keeping everybody profitably busy throughout the working hours. A half hour for lunch does not involve an hour's idleness, as the full force finishes and starts work together. There is no waste from loafing, and the whole working force is under the supervision of one superintendent at all times. There is no division of responsibility for results between two sets of men and equipment. There is no carelessness from rushing, no burnt asphalt and no chilled asphalt; and the investment in real estate or buildings, cars or sidings is saved.



PORTABLE ASPHALT PLANT.
Discharge End.

The machines are equally well adapted for laying sand aggregate sheet asphalt pavements, and for use of tar or other bituminous material when desired.

The Link Belt Company, of Chicago, are the manufacturers of the plant, and will gladly furnish additional information upon application.

Fire Test of Concrete Block Construction.

The concrete blocks manufactured by the Fisher Hydraulic Stone Co., of Mt. Gilead, Ohio, were recently subjected to a severe test in Baltimore, Md. A 4-story building used as a warehouse by the Patapsco Oil and Grease Co. caught fire about midnight, and owing to the quantity of oils and inflammables, was soon developed into a very threatening conflagration. So threatening was the fire that the second and third fire alarms were sent in and brought out fourteen fire engines, who were also assisted by the fire boat "Cataract" throwing a stream from the Chesapeake bay or basin, a distance of about 100 feet, into and against the burning building. This fire was fought with the same precaution as a wall constructed of brick, expecting that it would crumble and fall; three of the walls were self-sustaining and exposed. As the roof fell the flames extended high into the air. When this vent was given to the fire the inside became a roaring furnace of burning oil and oil saturated wood floors and joists.

Consider the tests the blocks were subjected to by this intense heat, and while heated quantities of water were poured on them, as through the openings and from the roofs of the adjoining buildings many streams of water poured on the top of the burning building. To the surprise of all of the fire department the walls remained unaffected, resisting these destructive elements. Thus aided, the firemen confined the fire to one building, and probably prevented another such conflagration as was experienced in that city in 1904.

When the walls would permit of inspection, still greater surprise awaited those who were interested, for not a cracked or injured block could be found and the walls stood as intact as before the fire. The mortar used in laying up this wall was burned to some depth in the joints between the blocks, making it necessary to point up before replacing the new floors. This is unquestionable evidence of the fire resisting qualities of the block, a further investigation by climbing to the very top and carefully inspecting the wall, and examining the blocks, found, as was reported, the blocks absolutely perfect and uninjured.

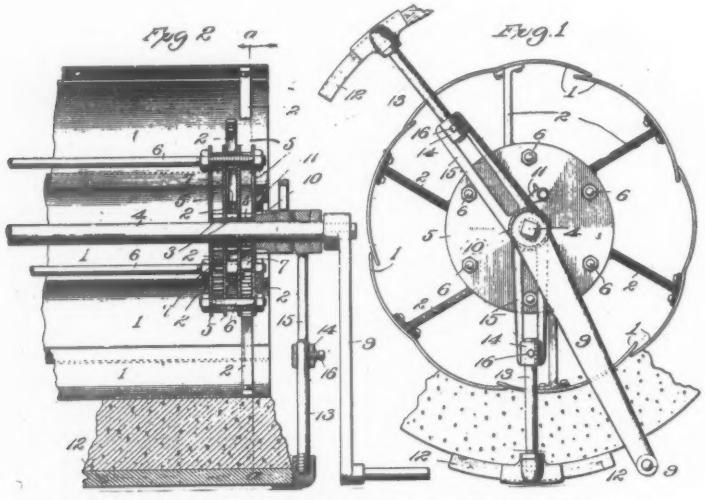
This test proves conclusively that concrete when manufactured correctly will stand where brick and other building material falls, and reveals the fact that a carefully graded aggregate thinly coated with cement, a wet mixed mortar, and then the aggregates rammed together by

powerful blows displacing the air and voids, produces a "fire proof concrete" verifying the tests made by high authority.

An Adjustable Culvert Form.

An exhibit which attracted a great deal of attention during the recent good roads convention in St. Louis was that of the Towship Supply Co., of St. Louis. In addition to a number of road graders, plows, drag scrapers, etc., there was exhibited the first one of the new adjustable culvert forms shown in the photograph and drawing accompanying.

The device is in an 8 ft. section, two sections being furnished with each set of forms. The size shown is adjustable to any side culvert varying from 14 to 24 inches; while a larger size will



ADJUSTABLE CULVERT CENTERING. DETAIL DRAWING.

be manufactured for culverts from 28 to 72 inches in diameter.

The manner of using the form is simple in extreme. The centering is placed in the position desired and adjusted to the required size by means of the crank (9). The concrete is then placed as needed. The required thickness being obtained by means of the gauges (12) set on the adjustable arms (13-16). After the concrete has set the form may be very easily collapsed, by turning the crank (9) in the reverse direction. This is accomplished through the medium of small cogs, which engage pinions on the arms (2) drawing them, and the longitudinal strips to which they are attached, towards the center. The whole form may then be drawn out without trouble.

The Township Supply Co., 2947 Lawton ave., St. Louis., Mo., are the manufacturers.

Timberasphalt.

About 8 years ago, the Santa Fe Railroad had been having a great deal of trouble with the question of the rapid decay of their ties. Untreated ties placed on that portion of their tracks through the Southwest, lasted for about 2 years and in some cases only 9 months. An experimental track was built in Texas in which the ties were treated with asphaltic oils, and these ties are still in active service. As a result of this test, they are now treating about 750,000 ties annually with asphalt oil.

The Indian Refining Co., of Cincinnati, Ohio, is now manufacturing a special product known as "Timberasphalt," for the purpose of water proofing and preserving woods. This material is composed, as its name implies, of asphalt oils which have been so successfully used under the worst climatic conditions. Other recommendations are its low cost and its ease of application.

There are several methods of treating wood with this preservative. The most simple method and one which has been found to give good results is the brush method, in which the hot product is applied with a brush. Telegraph poles, fence posts, cross arms and structural timbers have been successfully treated by this process.

The open tank is largely used where a large plant is not available. In this process the wood is immersed in the hot Timberasphalt at a temperature of 215 deg. F. and left for several hours. The air and water in the wood are expellid by their expansion under the high temperature. The liquid is then allowed to cool to about 150 deg. F. and the contraction and atmospheric pressure cause the oil

to be forced into the wood. The Timber-asphalt may also be used under pressure.

The advantages claimed for the product may be given briefly as follows:

Its burning point is very high, about 365 deg. F..

It will not decompose under action of the elements.

It is practically non-volatile and inert, none of its value being lost by evaporation.

It is non-soluble in water.

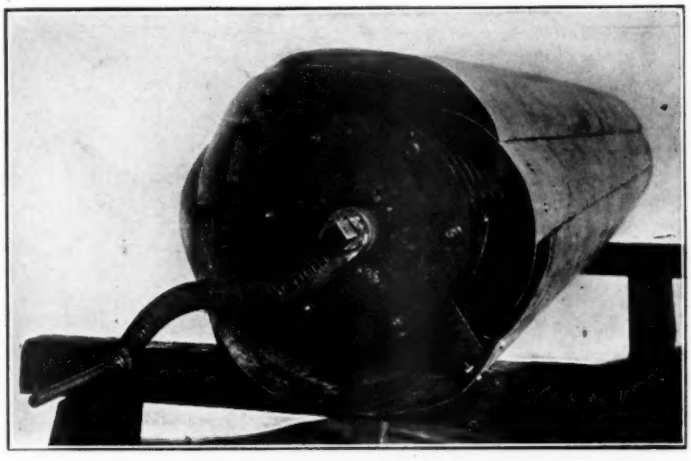
It has a low co-efficient of expansion.

It will not bleed from the timber after treatment.

It may be used as a substitute for paint.

It may be handled without physical injury to those who come into contact with it.

It may be applied either by brush, open tank or pressure method.



ADJUSTABLE CULVERT AND SEWER CENTER.

It may be applied in maximum quantities without excessive first cost.

Further information may be obtained from the Timber Treating Department of the Indian Refining Co., Cincinnati, O.

Wood Water Pipe.

The A. Wyckoff & Son Co. of Alexandria, La., have an unusually complete book describing their product, wood pipe. The introduction deals with the history of water pipe from the old hollow logs down to the present product. Next is a description of the plant at Alexandria, followed by a comparison and notes on the two kinds of wood, cypress and gum.

Following this division are a number of sections devoted to the Wyckoff pipe, its construction, advantages, laying, specifications, method of tapping and quotations of cost. The balance of the book is devoted to tables of friction loss in wood and cast iron pipe, and a partial list of users of Wyckoff pipe.

Free Construction of Good Roads.

The J. I. Case Threshing Machine Company of Racine, which is now largely engaged in the manufacture of road making machinery, has sent a letter to Town Chairman Joseph Bishop, of Somers, Wis., in which it offers to aid materially in completing the improvement of a road from the limits of the City of Kenosha through the entire east end of the town of Somers. It is the plan of the company to give the people of the two counties an object lesson in the use of road making machinery and to this end the company is ready to expend considerable money provided the town sees fit to aid the work. The cost to the town will be small in comparison with the work that is to be done and as the road between the two cities is one of the roads in the county most used by the farmers it is thought that the town board of Somers will see its way clear to accept the proposition. The plan for carrying out of the work is stated in the words of the letter offering the proposition as follows:

For the purpose of creating an object lesson in practical methods of modern road building, we have agreed to furnish to the town board of Mt. Pleasant the road building machinery, consisting of 10-ton road roller, engine, scrapers, etc.—together with a full complement of men to operate the same effectively—free of charge to the board, the only condition being that said board undertake to deliver and spread the necessary gravel to complete the work and supply the necessary culverts, etc., for drainage.

It is our desire to extend this work to the north city limits of the city of

Kenosha, through the township of Somers, provided a similar arrangement can be carried out with your honorable board. It is our understanding that the farmers of your township use this road extensively in marketing their produce and we would ask that our proposition be given your careful consideration.

The Gravity Carrier in Paving Work.

In the August number of MUNICIPAL ENGINEERING mention was made of a "home-made" device for handling brick upon street paving work. The Mathews Gravity Carrier Co., of Minneapolis, now has a carrier which goes a step farther in the economical handling of brick.

The photograph produced herewith shows the use of the carrier in delivering brick from the supply pile to the layer. The rollers shown are attached to the rigid frame at both ends and revolve upon ball bearings. For the purpose of guiding the brick and preventing their falling from the carrier, each roller is enlarged to a disk at the end, which is not an inch greater diameter than the roller.

MATHEWS GRAVITY PAVING BRICK CARRIER IN OPERATION.

The advantages of the carrier lie in the fact that the brick can be delivered just as needed, and that fewer men are required to handle them. Under the old system of wheeling them on the street or carrying them by hand, from 3 to 5 men were required. With the gravity carrier only two men at the most are needed.

In addition to the direct economy of delivery, there are several indirect advantages which will be at once appreciated by the person who is familiar with brick paving work. The brick are delivered directly to the place where they are required. They are not thrown into wheelbarrows and dumped upon the finished pavement to the more or less serious damage of their edges and corners. There is no tracking of mud upon the completed surface, requiring a cleaning of the surface before the cement filler can be used. Other advantages may arise due to local conditions, but those previously stated are true under all conditions. For catalogues and further information address The Mathews Gravity Carrier Co., Minneapolis, Minn.

Proper Coal Buying.

The determination of the exact heating value of solid or liquid fuel is the only logical basis upon which to buy such fuel. The larger cities have recently adopted specifications providing for full tests of all coal supplied for their use. It is only a question of time until the practice of demanding coal testing up to the required B. t. u. will supersede the habit of ordering "Pochahontas," or "Para," or "New River" coal; for it has been shown that in nearly every district producing high-grade coal there are occasional seams of the poorest variety.

The Emerson Fuel Calorimeter, manufactured by Eimer & Amend, 205-211 Third ave., New York City, is designed for the thorough and accurate testing of the calorific value of fuels. The apparatus is of the bomb type and the method of its use is briefly noted as follows:

The sample for testing is carefully weighed and placed in a platinum pan suspended in the center of a steel bomb so constructed as to be made air tight. Connected to this pan are contact wires so arranged as to fire the combustible within, upon application of a current of electricity. After suspending the pan and its charge in place and closing the bomb, oxygen is admitted through a valve at the top until a pressure of 300 lbs. per square inch is obtained. The bomb is then immersed in the water within the calorimeter. The water in the calorimeter is kept constantly in motion by a special motor stirring device, from two to three minutes preceding the start of the test until its completion. With the bomb in place the

electric contact is closed, firing the fuel in the platinum pan. The rise in the temperature of the water is noted and the fuel value is deduced from the difference in temperature of the water produced by the combustion of a known quantity of the fuel. The test is simple in its application and its universal adoption will lead to conditions such that the buyer will pay for value received.

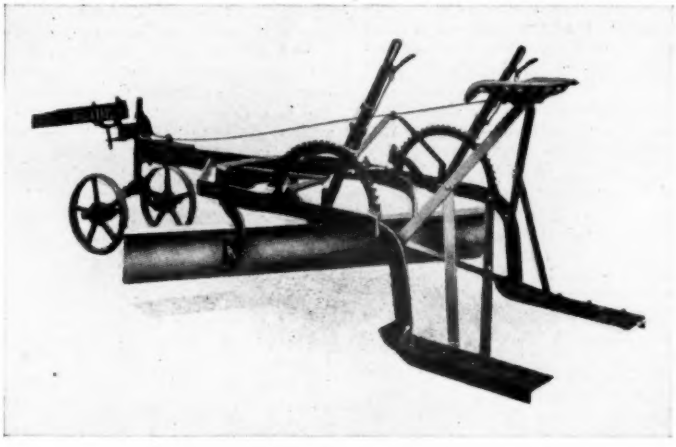
An Economical Road Leveler.

One of the great detriments to the advancement of the cause of good roads is the difficulty in getting labor and teams enough and at the proper time to carry on the needed work. It is difficult at any time to obtain help from the farmers, upon whom devolves the greater part of the road maintenance, and often the number of men procured is insufficeint to handle the more cumbersome machinery commonly used on such work.

The Glide Road Machine Co. of Minneapolis, Minn., has recently put upon the market a machine which should revolutionize the method of maintaining earth roads. This machine is a two horse, one man, road leveler capable of doing the work of the old four horse scraper. This machine should be found of especial value for use on the outlying streets of cities; streets which in most cities are entirely neglected, making a more or less serious barrier between the pavements and the rural pikes.

The leveler consists of the common form of scraper blade mounted on a rigid framework in such a manner as to be raised 8 inches above ground when not in operation. Mounted upon this frame is a seat so arranged as to give stability and additional cutting power. To this frame is attached a strong tongue so forged as to prevent its sagging or swinging against the horses.

In the manner of supporting the machine is perhaps the most noteworthy feature. In the place of wheels, two flat steel shoes with outside flanges allow the machine to slip over the ground in a smooth path, without the added weight of wheels and axles. The sharp flanges entirely prevent any tendency towards sliding or skidding and assure a uniformity of surface usually very difficult of attainment. It may be used with equal facility over ditches or uneven ground. In addition to this use the machine will be found valuable in keeping up lanes, digging gutter ditches, keeping down weeds, etc. It is especially useful in cleaning walks and crossings of snow during the winter. For full information regarding this machine, address the Glide Road Machine Co., Minneapolis, Minn.



THE GLIDE ROAD GRADER.

The Destructor Company.

The above is the title of a forty page book issued by the Power Specialty Company of 111 Broadway, New York City. The greater part of the book is given to the history, description and illustration of the Milwaukee refuse destructor. The tests and costs of operation are given with this division. The drawing the following wagon to enjoy waukee system are very complete in detail and serve to make clear the accompanying discussion. A photograph showing the garbage wagons used, is not altogether conclusive evidence of their being sanitary, for the covers are shown to be so warped as to allow the horse drawing the following wagan to enjoy a quiet little lunch from the wagon preceding.

The latter half of the book is devoted to the descriptions of the West New Brighton and Westmount Refuse De-

structors. The discussions are of the nature of reports rather than advertising literature and will be found of value in estimating the worth of the destructors noted.

"Pioneer" Filler Asphalt.

A small booklet dealing with "Pioneer" filler asphalt in use on paving work has been prepared by the American Asphaltum and Rubber Co., Chicago, Ill. Complete specifications for the filler and tests for attaining these specifications are given in the first pages. Following this are given the arguments for the type of filler advocated and a number of letters from city engineers and those who have used "Pioneer" filler. The latter part is given up to comparisons and methods of estimating quantities desired.

Ornamental Street Lighting.

In considering the problem of street lighting there is also that question of ornamentation which must be dealt with when it is considered that the supports or standards which support the lights and are comparatively unnoticed at night, will become the most noticeable feature of the street by day. Since the almost universal adoption of the cluster light system of street illumination, there have been a great many types of standards designed. These have varied from the severely plain standard, Quaker-like in its simplicity, to the very ornate designs, with frills and ornamentation effectually concealing the purpose for which the standard had been intended.

The standard shown in the accompanying photograph was designed and is manufactured by the Flour City Ornamental Iron Works, of Minneapolis. It is the happy medium between the two extremes just noted that seems to be coming into great popularity. The design, as will be noted, is consistent in every particular. The Corinthian standard, as it is named, is entirely Corinthian from the column and base to the four arms holding the globes. Every part, in addition to its beauty of design, is constructed with the idea of strength and solidity.

The standard is of the finest grade of cast iron, weighing 1,150 pounds. The base is set on a solid concrete block and attached to the block by means of 4 imbedded steel bolts. The globes are of hail proof opalescent glass, frosted on the inner side. Altogether, in addition to being one of the most artistic, it is also one of the most durable standards made.

Trade Publications.

The Milburn Light" is a booklet descriptive of various forms of acetylene lights manufactured by the Alexander Milburn Co., of 509 Lombard St., Baltimore, Md. Full description with illustrations of a number of types of the lamp are given, together with matter pointing out the adaptability and numerous uses of them. The company had a very interesting exhibit at the Good Roads Convention in St. Louis Sept. 28-30.

"Concrete in Highway Construction," a publication of the Atlas Portland Cement Co. that may be purchased by others than highway engineers at a cost of one dollar, was presented to all who inquired for it at the St. Louis Good Roads Convention. The book is of great practical value in its description and illustration by photographs and drawings of every possible use of concrete in road construction. The drawings of form construction, tables and descriptive matter are given in such detail as to be easily understood and followed.

Monthly Bulletin No. 77 of the Universal Portland Cement Co. contains a number of illustrated items of value. Several points of interest to the persons receiving shipments of cement, are given.

"The Wadsworth Macadam" is a booklet devoted to specifications, comments and tests relative to road construction by the use of Kentucky Rock Asphalt. The process is illustrated by photographs from the mining of the material to the stage of the finished road. The booklet may be obtained from The Wadsworth Stone and Paving Co., Pittsburg, Pa.

At the Good Roads Convention in St. Louis Sept. 28-30 the American Asphaltum and Rubber Co. had a very interesting exhibit of photographs and literature relative to their product. A copy of their booklet on road construction was given upon application. This booklet contains data on waterproof macadam road construction as well as complete specifications for the use of "Pioneer" road asphalt in such construction.

The Huber Manufacturing Co., of Marion, Ohio, have a folder descriptive of their combination traction engine and road roller.

"Yellow Pine Creosoted Blocks" is a complete discussion of the subject above mentioned, together with matter of value on the wood block paving question in general. It may be obtained from the Yellow Pine Manufacturer's Association, St. Louis, Mo.

"The Why of the Kelly-Springfield Roller" is a pamphlet treating of the uses and advantages of that piece of road machinery. Mention is made of booklets fully describing all the types manufactured by the company at their factory in Springfield, Ohio.

"Why a Pitch Filler" describes the reasons for using Barrett's Paving Pitch. The same company has issued a new engineer's handbook which will be mailed upon request.

"Furnace Slag" is a booklet issued by the Perry Iron Co., of Erie, Pa. The uses, weights, prices, etc., of the product

mentioned are fully discussed in a brief and complete manner. A number of testimonials are submitted with the booklet.

"The American Ditcher" is an unusually complete description of a ditching machine manufactured by the American Ditching Machine Co., of West Minneapolis, Minn., each point of the machine mentioned is illustrated by a small drawing set into the line of descriptive matter. Cost of operation is given.

The Standard Asphalt and Rubber Co. have a new dipping tank for applying Sarco mineral rubber pipe coating, a description will be sent on request.

The St. Mary's Sewer Pipe Co., St. Marys, Pa., has an illustrated catalogue with tables of weights, dimensions, prices, etc., of their pipe, specials and fire clay products.

Parmley System Reinforced Concrete is fully described in an illustrated booklet, showing actual construction and use of their system.

The T. L. Smith Concrete Equipment Company of Milwaukee, Wis., has a booklet for distribution, dealing with the various well known types of mixes which they handle. A supplementary leaflet descriptive of a new machine, a hand concrete mixer, which should meet with favor for use in sidewalk and other small work, is given out.

Trade Notes.

CEMENT.

Kansas City, Mo.—The Iowa stockholders, representing stock to the amount of $230,000, of the Lumbermen's Portland Cement Co., of this city, voted to accept the plans of W. E. Woods, president, for the reorganization of the company.

CONCRETE BLOCKS.

West Duluth, Minn.—W. K. Kilton, sidewalk contractor, has invented a concrete tie.

PURCHASE OF MACHINERY.

Chanute, Kas.—J. T. Rustamier, 601 W. 7th st., is in the market for some one-horse carts for handling stone and excavated material.

PURCHASE OF MATERIALS.

Boston, Mass.—Bids are asked until Nov. 12 for furnishing riprap for dike and breakwater at Princeton Harbor and Point Flats. Col. Frederic V. Abbot, Corps. Engrs., U. S. A.

MISCELLANEOUS.

New York City.—An important change in the management of the Goldschmidt Thermit Co., 90 West st., has been announced. Commencing with Oct. 1, E. Stutz, vice-president and general manager, retired from the direction of the company, which passed under the management of William C. Cuntz. Mr. Cuntz brings to his position a thorough knowledge of the steel business and a wide reputation with the railway and street railway officials of the country, having been connected for eighteen years with the Pennsylvania Steel Company.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

CONTEMPLATED WORK.

Oconomowoc, Wis.—Paving is contemplated for Main st.

Clarion, Ia.—The question of paving the streets is being urged.

Lansing, Mich.—Brick repaving is contemplated for Washington ave.

Winona, Minn.—This city contemplates 1 mile of brick paving to cost $25,000.

Springfield, Ill.—Paving Jackson, Edward and Reynolds sts. is contemplated; $91,316.

Carthage, Mo.—A resolution has been passed providing for the graveling of Orner st.

Owatonna, Minn.—Will vote Nov. 8 on the issue of $30,000 paving and sewer bonds.

Boone, Ia.—About 14 blocks of brick paving is contemplated. K. C. Kastner, city engineer.

Waterloo, Ia.—Grading, curbing, guttering and paving is contemplated for 4th st.

Duluth, Minn.—The question of paving W. 3d st. from 20th to 29th aves. is being urged.

Winona, Minn.—About $20,000 will be expended for brick paving. Paul A. Jasmer, cy recdr.

Lake City, Minn.—The reconstruction of cement or concrete sidewalks is contemplated.

Spokane, Wash.—Plans and specifications have been approved for improving a number of streets.

Hastings, Minn.—A petition has been submitted to council asking that Hastings ave, be paved.

Coalina, Cal.—The city intends laying about 121,000 sq. ft. asphalt macadam. F. J. Borland, city engr.

Rising Star, Tex.—This town voted to issue $10,000 for street improvements and constructing sidewalks.

Springfield, Mo.—Resolutions have been passed for paving Lombard and Belmont aves. and N. Grant st.

Wetumpka, Ala.—It is stated that Elmore county will spend the $175,000 recently voted for good roads. E. W. Jones,

U. S. highway engr., recently made provisional survey for the proposed road.

Elkhart, Ind.—Paving is contemplated for 19 blocks in Oakland and California aves. A. M. Smith, city engr.

Cosmopolis, Wash.—This place is making plans for the laying of about 30,000 ft. of pavement the coming year.

Twin Falls, Idaho.—This place has voted bonds in the sum of $50,000 for street paving, fire apparatus, etc.

Dallas, Tex.—Resolutions have been adopted for paving Holmes st. and Grand ave. J. B. Winslett, city secy.

Rock Island, Ill.—Brick paving is contemplated for 13th ave. from 24th to 25th st., at a cost of about $5,820.

Carroll, Ia.—The city council has decided to construct 9 blocks of brick paving on concrete in the main business district.

Greenville, Ill.—It is reported that the city officals are considering the construction of concrete pavements on several streets.

Fond du Lac, Wis.—The Fond du Lac Land Co., S. D. Wyatt, anticipates building 12,000 ft. of concrete walk in North Fond du Lac.

Newark, N. J.—Ordinances have been passed for paving 13th ave. with asphalt and for grading, curbing and flagging Parkhurst st.

Cedar Falls, Ia.—The county board has decided to pave the bridge over Cedar river with creosoted blocks next spring.

Kenosha, Wis.—R. H. Moth, clerk, has plans under consideration for 4,927 sq. yds. of brick paving, concrete curb and gutter.

Gary, Ind.—T. E. Knotts, pres., city hall. Paving, curbs and sidewalks on 1st st., 1½ miles, cost $10,000, are contemplated.

Waterloo, Ia.—North Fourth st., Bridge st. and Commercial st, are to be paved with sheet asphalt with brick between the car tracks.

Crookston, Minn.—Council rejected all bids for paving and directed the city engineer to prepare plans for paving 3rd st. with asphalt.

Laporte, Ind.—The board of county commissioners contemplates the construction of 8 miles of the Van Kilkinson gravel road. Clyde Martin, Co. engr.

Toronto, Ont.—Paving is contemplated for Wellesley Lane, Grand View, Hampton, Strachan and Pacific aves., Dovercourt road, Sackville and St. Vincent sts.

Sioux City, Ia.—Council has decided to pave 9 streets with concrete during 1911. Corrugated concrete will be used on the highgrades.

East St. Louis, Ill.—Brick paving has been decided upon for 38th st. instead of creosoted wood blocks. Wm. J. Crooken, city engr.

Waco, Tex.—The residents and property owners in Exposition Park decided upon asphalt macadam for street paving at a meeting held Oct. 13.

Cadillac, Mich.—Council voted to adopt the plans, specifications and estimates for improving 1st ave. Most of the work will be done next spring.

Streator, Ill.—An ordinance has been passed providing for the construction of a concrete and cement sidewalk with stone curbing in Monroe st. P. J. Lucey, mayor.

Baker City, Ore.—Council has passed resolutions calling for bids for paving of North Main, Auburn, Resort, Bridge and 2d sts.; cement walk will be laid on 4th st.

Farmville, Va.—This city is considering expenditure of $30,000 in road improvements; material, bitulithic or vitrified brick; granolithic sidewalks and cement gutters on hillsides.

Kansas City, Mo.—Resolutions were adopted Oct. 11 for constructing artificial stone curbing and sidewalks, asphalt and rock asphalt paving in various streets, and concrete paving in certain alleys.

Cincinnati, O.—The county commissioners have ordered plans for improvement of River road at cost of $3,743, and for improvement of Mill road, from Totten's gate to Loveland and Madeira pike, at cost of $2,853.

Paducah, Ky.—This city will soon ask bids on construction of concrete sidewalks, curbs and gutters on Jefferson and 10th sts.; grading and graveling 14th st., and for construction of sidewalks on Flourney st. L. A. Washington, city engr.

Cincinnati, O.—Ordinances have been passed providing for paving and curbing Whiteman st.; constructing concrete supporting walls and reinforced concrete steps in Baymiller and N. Elm sts.; macadamizing, curbing and gutters in Probasco ave. John Galvin, prest. coun.

Munday, Tex.—This city voted to issue $5,000 bonds for street improvements.

Ashland, O.—The citizens have petitioned for brick paving, curbing and grading in Diamond Highway.

Portland, Ore.—The citizens of the state will vote in November on the issue of bonds for constructing roads.

Lancaster, O.—A resolution has been adopted authorizing the city engineer to prepare plans and specifications for paving Ewing st.

CONTRACTS TO BE LET.

Sullivan, Ind.—Until Nov. 9, for constructing a stone road. Ben. C. Crowder, co. audit.

Stanley, N. D.—Bids are asked until Nov. 5 for constructing several grades. W. C. Gibb, co. audt.

Logansport, Ind.—Until Nov. 15 for constructing a road. George W. Cann, so. audit.

Danville, Ind.—Until 10 a. m. Nov. 7, for constructing three roads. W. H. Nichols, co. audt.

Fowler, Ind.—Until 1 p. m., Nov. 7, for constructing four stone roads. Lemuel Shipman, co. audt.

Fernandina, Fla.—Bids are asked until Nov. 10 for paving Center st. with vitrified brick. G. L. Baltzell, cy. clk.

Rensselaer, Ind.—Until 12 m., Nov. 9, for constructing five stone road improvements. James N. Leatherman, co. audt.

Vernon, Ind.—Until 11 a. m., Nov. 7, for constructing 2½ miles of pike road in Bigger township. T. L. Thomas, co. audt.

Ft. Wayne, Ind.—Until 10 a. m., Nov. 12, for improvement of highways in Maumee township. George W. Lindesmith, co. audt.

Olympia, Wash.—Until 2 p. m., Nov. 2, for grading, draining and macadamizing State Aid work No. 54. Henry L. Bowlby, secy. highy. bd.

Seattle, Wash.—Until 11 a. m., Nov. 5, for constructing roads, walks, drains, crossings, etc., at Ft. Ward. Capt. C. Long, contn. qm.

Crowley, La.—Bids are asked until 8 p. m., Nov. 23, for constructing 33,000 sq. ft. of 6 in. concrete street crossings. T. J. Boudreaux, cy. clk.

Brooklyn, N. Y.—Bids are asked until Nov. 2 for repaving 4,430 sq. yds. of E. 8th st. with asphalt concrete on macadam base. Alfred E. Steers, pres. boro.

Newark, N. J.—Bids are asked until 10 a. m., Nov. 10, for grading and paving

with telford, the following streets: Gregory ave., 8,846 ft. in the town of West Orange; Union ave., 6,133 ft., from Belleville twp. to town of Nutley; Green Brook road, 1,333 ft. of macadam coating, from Caldwell twp. to North Caldwell. Com. on roads and assmts., bd. chosen freeholders.

Huntington, W. Va.—Until 1 p. m., Nov. 14, for paving three alleys with vitrified brick. John Coon, comr. sts.; A. B. Maupin, cy. engr.

Hallock, Minn.—Until 1 p. m., Nov. 1, for constructing state roads Nos. 2 and 3, involving 37,250 sq. yds. earth and 8 20x34 concrete culverts. C. J. Hemmingson, co. audt.

Oakley, O.—Sealed bids are asked until 12 m., Nov. 1, for constructing cement sidewalks in Follet, Carpenter and Dawson aves. and Kline and Addie sts. Oscar Kosche, vil. clk.

Dubuque, Ia.—Until Nov. 6, for constructing 5,028 sq. yds. telford macadam paving, and 2,672 lin. ft. combined cement curb and gutter in Delphi st. (Private plans.) Otto P. Gieger.

Newark, N. J.—Bids are asked until Nov. 10 for paving 14,979 ft. of Gregory and Union aves. with telford macadam and coating 13,334 ft. of Green Brook road with macadam. Wallace Ougheltree, dir. freeholders.

Rushville, Ind.—Until 2 p. m., Nov. 10, Jesse M. Stone, audt., court house. Gravel roads in Posey and Ripley townships and macadam roads in Noble, Anderson and between Ripley and Posey townships; bonds required.

Trenton, N. J.—Until 10 a. m., Nov. 10, for telford paving in Gregory and Union aves. and macadam in Green Brook road. Wallace Ougheltree, dir. committee on roads and assessments of board of freeholders.

Chicago, Ill.—Sealed bids are asked until 11 a. m., Nov. 2, for paving Ogden ave. with No. 2 granite blocks, from Western ave. to present brick pavement in Ogden ave. ($100 cash or certified check.) B. J. Mullaney, comr. pub. wks.

Jacksonville, Fla.—Until 9:30 a. m., Nov. 1, for grading, curbing and paving 25 miles of hardsurfaced county roads, with brick, concrete, asphalt macadam, bitulithic, or other material. F. J. Hyde, chrm. co. comrs.

Columbus, O.—Until Nov. 1 for grading and macadamizing 2 miles road in Preble county; until Nov. 2 for 2.59 miles in Lucas county; until Nov. 9 for 1 mile brick paving in Geauga county; until Nov. 9 for 1.09 miles brick paving in Noble county. James C. Wonders, state highway comr.

Cincinnati, O.—Bids are asked until Nov. 18 for constructing county road work. Fred Dreihs, clk. co. comrs.

Westfield, N. J.—Bids are asked until 8:15 p. m., Nov. 7, for improving certain streets with macadam, concrete curb and gutter, etc. Lloyd Thompson, town clk.

Cincinnati, O.—Bids are asked until Nov. 4 for paving Pogue ave. with brick, with limestone curbs and drains and inlets. John J. Wenner, clk. bd. pub. ser.

Shelbyville, Ind.—Bids are asked until 7:30 p. m., Nov. 1, for constructing sidewalks, gutters, etc., in several streets. L. E. Webb, cy. clk.

New Orleans, La.—Bids are asked until Nov. 18 for constructing roads and walks at Jackson Barracks, La. Geo. B. Davis, acting Q. M., 416 Hibernia Bank Bldg.

Sedalia, Mo.—Bids are asked until 5 p. m., Nov. 7, for constructing concrete curbing in Osage ave. C. E. Baker, cy. clk.

CONTRACTS AWARDED.

Memphis, Tenn.—The contract for paving McLemore ave. with asphalt was awarded to the Barber Asphalt Paving Co., of Chicago.

Hastings, Neb.—The contract for brick paving was awarded to O. C. Chapin, at $2.04 a sq. yd.

Pekin, Ill.—Jansen & Zoller, of this city, secured the contract for paving 3 sts., for $14,000.

Lafayette, Ind.—The contract for constructing the Brown gravel road was awarded to D. H. Fatout, for $3,925.

Springfield, Mo.—The contract for paving State st. with brick was awarded to J. C. Likes, at $2.14 a sq. yd.

Tarkio, Mo.—The contract for paving Main st. was awarded to Wellman & Olson, of St. Joseph, for $25,000.

Ottawa, Ill.—The contract for paving Chartres street was awarded, Oct. 12, to Keys & McNamara, for $18,033.50.

Peoria, Ill.—A. D. Thompson has the contract for paving Garfield ave., $7,320.

Coffeyville, Kan.—Contract for paving awarded to McGuire & Stanton, of Leavenworth, Kan., $20,000.

Lexington, Ky.—Macadam roads on Park and Woodland aves. awarded to C. C. Miller & Co.

Granby, Conn.—The board of selectmen of this town has been awarded contracts for paving two sections of road.

Chicago Heights, Ill.—About 18,000 sq. yds. brick paving awarded to Chicago Heights Coal Co., $49,641.

Stamford, Conn.—L. F. Merritt was awarded the contract for building 2,305 lin. ft. macadam-telford road.

Mansfield, Conn.—Tony Leo was awarded a contract for constructing 6,475 lin. ft. of gravel-telford road.

Eldora, Ia.—Dearborn & Jackson Co., of Cedar Rapids, have been awarded the paving work in this city.

Brownville, Pa.—The contract for paving the State road with brick was awarded to Wm. C. McCormick for $7,080.

Hoquiam, Wash.—The contract for improving Fillmore st. was awarded to the Aberdeen Construction Co., of Aberdeen, for $1,380.

Kansas City, Mo.—The Jaicks Asphalt Co. of Chicago, was awarded a contract for paving 8th st. with asphalt, at $1.76 a sq. yd.

Olathe, Kas.—The contract for constructing 4½ miles of rock road was awarded to Ransom & Cook, of Ottumwa, Kas., for $30,456.

Elyria, Ill.—The McCarthy Improvement Co., of Davenport, Ia., was awarded the contract for paving N. Spring st. with mineral rubber, for $52,500.

Tarpon Springs, Fla.—The contract for paving with vitrified brick was awarded to the Chattanooga Paving Co., of Chattanooga, Tenn., for $45,000.

Cumberland, Md.—Frederick Perry was awarded a contract for repaving Union, East Center and Harrison sts, for $9,351.

Jackson, Tenn.—The city council adopted bitulithic material for paving and awarded the contract to the Southern Bitulithic Co., of Nashville, at $58,000.

Parkersburg, W. Va.—J. W. Curry was awarded a contract for grading 3,000 ft. of road near Redwood, at 24½ cents a cu. yd.

East St. Louis, Ill.—Paving contracts were awarded, Oct. 20, as follows: Paving alley between 12th and 13th sts. and College ave. and State st., $4,688 and improving rock road from 9th to 19th sts., $2,917, Meyer Construction Co., St. Louis; improving Brady ave., G. A. Horn, of East

St. Louis, $21,923; Kansas ave., Gaynard & Sweeney, of East St. Louis, $7,832.72.

Portland, Ore.—Contracts for street improvements have been awarded as follows: Grading and conc. curbs, Elwood Wiles, Beck Bldg.; Peninsula Feed & Fuel Co., 769 Dawson st.; R. J. Debuhr, 711½ Williams ave.; Joplin & Meeks, B. of T. Bldg. Pavements: Warren Const. Co., Beck Bldg.; Oregon Hassam Paving Co., 805 B. of T. Bldg.

Seattle, Wash.—Street improvement contracts have been awarded as follows: Andrew Peterson, Pioneer Bldg.; for the grading of Rainier ave., at $34,802.50; Rufus Buck, 414 Central Bldg.; for the planking of Rainier ave., at $5,803; Agassiz & Hadley, 1212 Western ave., for the grading of alley in blk. 30, at $1,184; The Barber Asphalt Co., Henry Bldg.; for the paving of E. John st., at $2,672.20. Bids were rejected on the following work: For the paving of an alley in blk. 9, Capitol Hill add.; for the paving of alley in blk. 17 Boren's add.

Midvale, Utah.—The contract for paving the sidewalks was awarded to James Wood, of Murray, Utah, for about $5,000.

Erie, Pa.—C. T. Eastburn, of Yardley, Pa., was awarded the contract for experimental pavement in West Lake road, for $6,307.

Newington, Conn.—The contract for constructing 3,737.7 lin. ft. macadam-telford road was awarded to Thos. Kearney, of Minden, Conn.

Streator, Ill.—Contracts were awarded Oct. 10 as follows: Paving W. Bridge street with brick John Baer, $1.25; S. Vermillion st., George Swartz, $1.39 a sq. yd.

Des Moines, Ia.—The Bryant-Ford-McLaughlin Asphalt Paving Company has been awarded a contract for paving and constructing 37th st.

Weston, Conn.—The contract for constructing 2,600 lin. ft. of gravel-telford road was awarded to L. F. Merritt, of Stamford, Conn.

Cairo, Ill.—L. W. Johnson, of Danville, Ill., has the contract for paving Commercial ave., 59,975 sq. yds. brick pavement, ets., $110,553.

Kenosha, Wis.—A contract for constructing 1 mile of paving was awarded to John O. Jones, of Racine, for about $40,000.

Omaha, Neb.—The contract for grading the Southeast boulevard near Montanello Park was awarded to the Krautz-Turner Co. for $10,000.

Middletown, Ill.—The contract for constructing 26,000 sq. ft. of cement sidewalk was awarded to Harvey K. Rhoades, of Lincoln.

Voluntown, Conn.—The Eldredge Construction Co. of Mystic, Conn., was awarded two contracts for gravel-telford road, for $3,915.

Redding, Conn.—Contracts for constructing 5,575 lin. ft. of gravel-telford road have been awarded H. Sanford Osborn and Herbert S. Barnes, aggregating a total of $4,125.

Lockland, O.—The Kirchner Construction Co., 8th and Plum streets, Cincinnati, has been awarded a contract for paving Wayne ave. with vitrified brick, for $32,000.

Newark, N. Y.—The contract for constructing 2 miles of curbing in West Miller street has been awarded to Hagaman, Miller & Hagaman, of Rochester, for $10,000.

Harrisonville, N. J.—Harry Clark, of Delaware City, Del., was awarded a contract for building a government road from Ft. Watt to this city, for $10,000.

Oakmont, Pa.—The contract for 1,000 sq. yds. of paving, 451 lin. ft. curb and gutter, and 384 cu. yds. of grading was awarded to James Topley & Co., of McKeesport..

Regina, Sask.—This city has recently awarded a contract for 21,900 sq. yds. of bitulithic pavement to the Bitulithic & Constructing Co., Ltd., of Winnipeg, Man.

Woodburn, Ore.—The Warren Construction Company, of Portland, Ore., has recently been awarded additional contract for 3,000 yards of bitulithic pavement here.

Atlantic City, N. J.—The United Paving Company of Atlantic City has been awarded a contract for resurfacing approximately 22,000 sq. yds. of Meadow blvd. in Atlantic County, N. J., with warrenite.

East St. Louis, Ill.—The M. L. Harris Co. was awarded contracts for 15,046 sq. yds. of creosoted wood block paving and 9,503 lin. ft. of granitoid curbing in Vogel Place, Alhambra court, and 36th st., for about $42,000.

Providence R. I.—Alton A. Allen was awarded a contract for constructing macadam driveways and other improvements in North Park lands, for $15,392.

Baker City, Ore.—The contract for paving Bridge, Auburn, Resort, N. Main and 2nd sts. with bitulithic was awarded to the Warren Construction Company, at $2.25 a sq. yd.

Boston, Mass.—The Massachusetts highway comr. has just awarded a contract for the construction of a state highway in Rockport to T. L. Thompson, of Boston, for $4,906.

Des Moines, Ia.—The Bryant-Ford-McLaughlin Asphalt Paving Company was awarded a contract for paving and curbing 37th st. with asphalt.

Denver, Col.—The Gaffy & Keefe Construction Co. has been awarded a contract for street, curbing and sidewalk improvements in South Denver district No. 8, for $52,925.

Hermosa Beach, Cal.—The Barber Asphalt Paving Co., Henne Bldg., Los Angeles, was awarded a contract for constructing 2 miles of roadway, for $65,000.

Peoria, Ill.—Brewster & Evans secured the contract, Oct. 12, for paving North and South Adams streets from Hamilton to Bridge sts, with creosoted wood blocks, for $34,491.50.

Portland, Ore.—Contracts for street paving, aggregating $295,813 have been awarded the Independent Paving Company, Hassam Paving Company and the When Paving Company.

Portsmouth, O.—Samuel L. Rice has been awarded a contract for paving Sinton st. from Front to Gallia sts., with brick on a concrete base, with tar filler, for $5,131.

Memphis, Tenn.—The Barber Asphalt Co., of Chicago, was awarded the contract for paving McLemore ave. with asphalt, and immediately sublet the work to the Memphis Asphalt Co.

Mays Landing, N. J.—A contract for resurfacing witah Warrenite about 22,000 sq. yds. of the Meadow blvd. in Atlantic county has been awarded to the United Paving Co., of Atlantic City, N. J.

Albert Lea, Minn.—Fielding & Shepley, of St. Paul, secured the contract for paving Adams, Broadway, Water and Washington sts., aggregating 16,440 sq. yds., with wooden blocks, for $34,986.

Tacoma, Wash.—Paving contracts have been awarded as follows: Third st., McAdam & Co., $82,027; 15th ave., W., and Thorndike st., J. A. Zinkoin, $6,228; grading and curbing 14th ave., DeFlong &

Co., $988; concrete walks in Whitman ave. et al., Packard-Spink Co., $25,798.

Seattle, Wash.—Paving contracts were awarded, Oct. 11, as follows: Resurfacing, curbing and concrete walks in 17th ave., N., Peabody Bros., $9,850.82; brick paving and granite curbing, 3rd ave., Grant Smith & Co. and Stillwell, $81,006.20; concrete walks in Whitman ave., Packard-Spink Co., $25,768.90.

Pittsburg, Pa.—Contracts for improving roads were awarded Oct. 10, as follows: Monongahela river road, Ridge Bros., 407 4th ave., $10,486; Butler road, Ott Bros. Co., 414 Washington ave., $21,416; Brighton road, M. O'Herron Co., S. First and McKean sts., $5,691.

Bloomfield, Ind.—Contracts for constructing gravel roads have been awarded as follows: Elliott road to Frank Musselman, of Newberry, $4,605; Clayton road, Fred Carpenter and R. M. Stafford, of Lyon, $4,600; Dayhoff road, Samuel Hays, of Worthington, $5,298.

Alexandria, La.—Gailey & Clark was awarded a contract for paving Gould and Jackson aves. and Beauregard st. Gould ave. will be paved with vitrified brick for a distance of four blocks at $2.85 a sq. yd. and the remainder to the city limits with gravel, at 95 cents a sq. yd. Jackson ave. and Beauregard st. will be paved with vitrified brick at $2.75 a sq. yd.

McKees Rocks, Pa.—Paving contracts have been awarded as follows: Grading, curbing and paving School, Olivia, Guthrie and Robinson sts., M. O'Herron & Co., S. First and McKean sts., Pittsburg, Pa.: Gardiner and Page sts., Frank Bryan, 1259 Chartiers st., Pittsburg; constructing 10,000 lin. ft. cement sidewalks, 2,000 cu. yds. grading and 500 sq. yds. filling, W. F. Herschberger. Total cost $25,000.

Cincinnati, O.—B. Niehaus was awarded a contract for improving Lawrenceburg and Elizabethtown pike for $18,585. Other contracts have also been awarded as follows: Race ave., in Green township, N. Reubel, $4,522; improvement of Gurley road, Green township, N. Reubel, $8,554; South ave. and Werk road, J. Nickolson $7,750; Walton Creek road, R. S. Flynn, $1,437.

Montgomery, Ala.—Contracts have been awarded as follows: Bitulithic paving, Madison ave., Southern Bitulithic Paving Co.; Catoma and other streets, Barber Asphalt Pacing Co. The awards have been protested by the property owners.

Witchita, Kas.—A contract for paving two miles of E. Second st. was awarded to Rackliffe & Gibson, for about $85,000. Other paving contracts awarded are as follows: W. Douglas ave., Cleveland Trinidad Paving Co., $2.59 a sq. yd.; right-of-way of street car tracks in Central ave., W. G. McKee, $2.49; Wiley ave., Stuckey Construction Co., $1.99; Maple st., Nolan & Draper, $1.97; Erie st., Stuckey Construction Co., $1.99.

Seattle, Wash.—Hans Pederson, Alaska bldg., was awarded the contract for paving University st., at $29,648. De Fong & Co., 917 22nd ave., was awarded the contract for walks on E. 76th st. at $4,847; H. Dahlstrom, 2437 W. 56th st. for the installation of sewers on W. 57th st.; Hansen & Co., 4100 25th ave. S. W., awarded the contract for the construction of pile bridge on Whatcom ave., at $5,327.

Springfield, Mo.—Contracts have been awarded as follows: Brick paving in State st., J. C. Sikes, $2.14 a sq. yd.; Hassam paving, alley, Rackliffe-Gibson Construction Co.; concrete curbing and guttering, E. Walnut st., Will F. Plummer, 47½ cents a lin. ft.; cement sidewalks in Prospect ave., Nichols D'Onfro, 44 cents a lin. ft. for walks and 23 cents a cu. yd. for grading; concrete curbing in State st., J. Underwood, 38 cents a lin. ft.; cement sidewalks in Rogers ave., and concrete curbing in Center st., H. Proserpi.

Portland, Ore.—The Warren Construction Company, of Portland, has been awarded contracts for paving with bitulithic aggregating 80,000 sq. yds. in this city. The Pacific Bridge Company, of Portland, has also been awarded contracts for paving 15,000 sq. yards of streets with bitulithic.

Seattle, Wash.—Contracts for street improvement have been awarded as follows: Planking Olive st., Wm. Kopka, city, $9,496;; concrete walks, Whitman ave., Packard Spring Co., city, $25,768; brick paving and granite curbing, 3rd ave., Grant Smith & Co. and Stillwell, city, $81,000.

Harrisburg, Pa.—Bids were submitted, Oct. 13, for 79,853 sq. yds. of paving and 67,099 lin. ft. of curbing as follows: Barber Asphalt Co., for California or Pioneer sheet asphalt, $1.43 to $1.65 per sq. yd. and for curb 70 to 73 cents per lin. ft. for granite, 41½ cents per ft. for steel-bound granolithic or 30 cents for granolithic. The Central Construction and Supply Co. bid for Trinidad Lake sheet asphalt $1.42 to $1.98 per sq. yd. and for curb 74 to 90 cents per lin. ft. for granite, 40 to 65 cents for steel-bound granolithic or 30 to 45 cents for granolithic.

New York City—Bids were submitted, Oct. 15, for paving in Bronxboro as follows: Wikins ave., from Intervale ave. to Southern blvd., lowest bidder, Hastings Pavement Co., as follows: 3,430 sq. yd. completed asphalt block pavement, and keep same in repair for 5 years from date of acceptance, $1.75; 498 cu. yd. concrete including mortar bed, $5.92; 200 lin. ft. new curb, furnished and set in concrete, $1; 850 lin. ft. old curbstone, rejointed, recut on top and reset in concrete, 33 cents.; total, $9,363. The Barber Asphalt Co. bid for this work, $9,797. E. 135th st., from Southern blvd. to Locust ave.: Lowest bidder, Hasting Pavement Co., 6,735 sq. yd. completed asphalt block pavement and keep same in repair for 5 years, $1,63; 1,080 cu. yd. concrete, including mortar bed, $5.92; 800 lin. ft. new curb, 98 cents; 3,100 lin. ft. old curb, reset in concrete, 33 cents; total, $19,179. The Barber Asphalt Co. bid for this work $21,161. The Hastings Pavement Co. was also lowest bidder on paving E. 172d st., from 3rd to Park ave., with asphalt block on concrete foundation at $7,002. Walton ave., from Fordham road to Burnside ave. Lowest bidder, Uvalde Asphalt Paving Co., as follows: 12,230 sq. yd. bituminous macadam pavement and keep same in repair for 5 years, $1.25; 2,200 lin. ft. curb adjusted and new curb where required, 25 cents.; total, $15,837. Other bidders: Barber Asphalt Paving Co., $16,769.30; Asphalt Construction Co., $16,119. W. 165th st., from Anderson ave to Lin ave. Lowest bider, Atlanta Construction Co. 2,600 sq. yd. new granite block pavement on sand foundation, laid with cement grout joints, and keep same in repair for 1 year, $2.54; 600 lin. ft. new curb, 70 cents; 1,350 lin. ft. old curb, reset, 23 cents; 150 sq. ft. new bridgestone for crosswalks, 50 cents; 1,250 sq. ft. old bridgestone, relaid, 10 cents; total, $7,534. Totals of other bids: L. J. Moran, $8,224; M. Baird Construction Co., $8,418; Asphalt Construction Co., $8,397, and J. Farrell, $8,333.

SEWERS.

CONTEMPLATED WORK.

Deming, N. Mex.—A sewerage system is contemplated.

Barrington, Ill.—A sewer system to cost $59,000 is planned by this city.

Healdsburg, Cal.—The construction of a sewerage system is contemplated.

Toledo, O.—The construction of a sewerage system next year is contemplated.

Owatonna, Minn.—Will vote Nov. 8 on the issue of $30,000 sewer and paving bonds.

Niles, O.—The construction of sewers in Park and Hartzell aves. is contemplated.

Winsted, Conn.—This city voted to install a sewerage system. Borough warden.

Winfield, N. Y.—The citizens intend to build a $10,000 private sewer system.

Arkadelphia, Ark.—Council has decided to construct sewer system; cost about $35,000.

Alton, Ill.—Estimates have been prepared for constructing sewer in Danforth st.

Wooster, O.—The sum of $38,000 is asked for a new water supply at Bloomington reservoir.

Pecos, Tex.—Will vote on the issue of $25,000 bonds for constructing a sewerage system.

Westernport, Md.—Bonds for $75,000 water works and $10,000 sewer system have been issued.

Carthage, O.—Bids for a sewer system, to cost about $50,000, will be asked inside of 15 days.

Port Jefferson (L. I.), N. Y.—The question of installing a sewerage system is under consideration.

Gilbert, Minn.—Plans are being prepared for constructing a sewerage system.

Gilbert, Minn.—The citizens have voted $20,000 bonds to install sewerage system.

Sallisaw, Okla.—The citizens have voted $45,000 bonds for sewers. A. W. Bates, engr.

Pittsburg, Kas.—A resolution has been passed to build sewers in various streets. C. B. Hoyt, mayor.

Springfield, O.—The construction of sewers in various streets is contemplated. C. J. Bowles, mayor.

Topeka, Kas.—Petitions are being circulated for constructing sewers in all the districts not now drained.

Belle Plain, Ia.—Civil Engr. Hart, of Clinton, is preparing plans and estimates for a sanitary sewer system.

Grosse Pointe Park, Mich.—Plans will be prepared for constructing a sewerage system. Vil. trustees.

Rockville Centre (L. I.), N. Y.—The question of constructing a sewerage system is being discussed.

Kokomo, Ind.—J. H. Watson, city engr. Sanitary sewer 2,400 ft. vitrified 15-in. pipe on Tyner st. is contemplated.

Opelousas, La.—The city board of health has recommended the establishment of sewerage system for this city.

Louisville, Ky.—The city board of health has indorsed the $100,000 bond issue for the extension of the sewerage system.

Yorkville, N. Y.—The citizens voted, Oct. 15, to issue bonds for a sewerage system. Plans have been prepared.

Easton, Md.—Plans for sewers and sewage disposal works will be made by Clyde Potts, 30 Church st., New York City.

Hubbard, O.—The village council enacted the first legislation, Oct. 17, towards the establishment of a sewerage system.

Austin, Minn.—The city is planning sewer extensions on various streets to cost about $1,500. Frank Cronin, rcdr, city hall.

Wilmington, O.—The construction of a drainage and sewerage system is contemplated at a cost of about $90,000.

Bloomington, Ill.—Bids will be asked within a short time for Clay st. and Willard ave. sewers and McClan-Taylor st. water main.

Aberdeen, S. D.—Plans have been prepared by the city engineer for the construction of a sewer system. Estimated cost, $75,000.

Mason City, Ia.—The city will consider a resolution Oct. 17 for the construction of 650 ft. of 10-in. and 580 ft. of 8-in. sewer.

Pittsburg, Kan.—A $50,000 sewerage system and septic tank disposal plant is planned. Prof. W. C. Hoad, of the State University, engr.

Muskogee, Okla.—The city is planning a large sanitary intercepting sewer, for which City Engr. Clonts is making surveys and plans.

Bozeman, Mont.—Council has decided to construct portion of District Sewer No. 31 at cost of $2,893.75. A. M. Brandenburg, cy. clk.

Reading, O.—Plans and estimates for constructing a complete sanitary sewerage system will be prepared by Village Engr. Hosbrook.

Stockton, Cal.—The city engineer has prepared plans for construction a 6-ft. outfall sewer in Harrison, Market and Washington sts.

Little Rock, Ark.—The board of public affairs has decided to advertise for bids for construction of storm sewer in Main st. Frank Olive, secy.

Terrell, Tex.—Will vote Nov. 10 on the issue of bonds for constructing sewers and other improvements at the Central high school building.

Mobile, Ala.—Plans are being prepared for extending the sewerage and water systems. Wright Smith, chief engr., bd. pub. wks.

East Orange, N. J.—Representatives of Orange, Montclair, Glen Ridge and Bloomfield met here, Oct. 13, to discuss the question of building a joint sewer.

West Morgantown, O.—The West Morgantown Sanitary Water and Sewer Co. has been capitalized at $10,000 to construct sewer and water lines for the city.

Winterset, Ia.—Consulting Engrs., W. K. Palmer & Co., Kansas City, Mo., has prepared plans for 3 miles of sanitary sewer, septic and flush tanks. Cost $115,000.

Roseville, Cal.—This city has sold $78,500 bonds to be used for construction of a sewer system. J. H. Stineman, cy. clk.; U. S. Marshall, engr.

Allentown, Pa.—A committee of 15 has been appointed, with Col. Harry C. Trexler, chrm., to devise a plan for constructing a sewerage system.

Wilmington, Del.—An ordinance has been passed by the city council appropriating $30,000 for the construction of trunk sewers in the Ninth ward. Alexander J. Taylor, cy. engr.

Pottstown, Pa.—The state health commissioner has asked Burgess Charles Brooke to take some definite step by Nov. 1 for providing this town with a sewerage system and disposal plant.

Port Jefferson (L. I.), N. Y.—The installation of a sewerage system is contemplated, and a committee has been appointed to circulate a petition among the property owners.

Grand Island, Neb.—The State has appropriated $10,000 toward the construction of a sewer 1,000 ft. of which will be

in State land. The city will add $8,000 to this sum as their share of the expense. Bids will be asked soon.

Winsted, Conn.—Winslow Goodwin is chrm. of a committee appointed to secure a sewerage system. An expenditure of $5,000 has been recommended for preliminary engineering work and expert advice.

East Moline, Ill.—The Board of Local Improvements has decided to accept estimate furnished by Cy. Engr. H. G. Paddock on proposed extension of the sewer system; estimated cost $50,000; length 7 miles.

Los Angeles, Cal.—The residents and property owners in San Pedro have petitioned the city council to construct a storm sewer system for the protection of the business district of that part of Greater Los Angeles.

Rock Island, Ill.—An ordinance has been passed providing for the construction of a sewerage system south of the railroad tracks. Plans and specifications for approximately 7 miles of sewer have been prepared by Cy. Engr. Paddock.

Marcus Hook, Pa.—An ordinance has been passed for constructing a sewer in E. 9th st. R. L. Elliott, prest. coun.

Rochester, N. Y.—A public hearing was held Oct. 19 on the ordinance appropriating $500,000 for the purpose of constructing intercepting sewers, as a part of the proposed plan for sewage disposal and to avoid pollution of the lower river.

Newberg, Ore.—Voted, Oct. 4, to install a sewerage system.

Laramie, Wyo.—Will vote in November on the issue of $15,000 for improving the sewer system.

Lancaster, O.—The city engineer has been directed to prepare plans and specifications for constructing sewers in Frederick st. and the William Cox addition.

North Vancouver, B. C.—George S. Hanes, city engineer, advises us that this city is just beginning an entirely new sanitary sewerage system. The Provincial board of health has passed upon the plans.

CONTRACTS TO BE LET.

Jonesboro, Ark.—Until Nov. 5 for constructing a drainage canal. J. H. Burk, cy. engr.

Roseville, Cal.—Until Nov. 7 for constructing a complete sewer system. J. H. Stineman, cy. clrk.

Prosser, Wash.—Until 5 p. m., Nov. 1, for constructing a sewerage system. E. A. Coffman, cy. clk.

Carthage, O.—Until Nov. 8 for constructing an entire sanitary sewerage system. Lewis Hall, vil. clk.

Jermyn, Pa.—Until Nov. 7 for constructing a 10-in. sewer in Franklin st. John A. Loughney, secy council.

Bellefontaine, O.—Until Nov. 1 (change of date) for constructing sections 1 and 2 of sanitary sewer system. C. A. Guskeep, cy. engr.

Atlantic City, N. J.—Until 8 p. m., Nov. 14, for constructing a storm water drainage system in various streets. E. D. Rightmire, cy. engr.

South Milwaukee, Wis.—Nov. 1, J. H. O'Connell, clk. Sewer extension and purification plant, $25,000. Alvord & Burdick, Chicago, engrs.

Carthage, O.—Bids are asked until Nov. 8 for constructing a sanitary sewerage system. Lewis Hall, vil. vlk.

Cleveland, O.—Bids are asked until 12 m. Nov. 3 for constructing a drainage sewer. A. B. Lea, dir. pub. service.

Ft. Caswell, N. C.—Bids are asked until Nov. 18 for constructing sewers and cisterns here. Lieut. R. O. Edwards, constr. Q. M.

Mitchell, S. D.—Bids are asked until 1 p. m. Nov. 7 for constructing lateral sewers, consisting of branches. L. L. Ness, cy. audt.

Shelbyville, Ind.—Bids are asked until 7:30 p. m., Nov. 1, for constructing a sanitary trunk sewer system. L. E. Webb, cy. clk.

Atlantic City, N. J.—Bids are asked until 8 p. m., Nov. 14, for constructing a storm water drainage system. E. D. Rightmire, cy. engr.

Baltimore, Md.—Bids are asked until Nov. 2 for constructing lateral sewers in District 34A, sanitary contract No. 57. J. Sewell Thomas, cy. rgr.

Chicago, Ill.—Bids are asked until Nov. 2 for constructing tile pipe and brick sewers in a number of streets. Albert F. Keeney, prest. bd. local impvts.

Richmond, Ind.—Bids are asked until Nov. 10, for constructing 950 ft. of 24-in. pipe sewer. F. R. Charles, cy. engr.

Lincoln, Neb.—Bids are asked until 12 m., Nov. 7, for constructing a number of sewers, with pipe branches, manholes, etc. L. L. Ness, cy. audt.

Ft. Dodge, Ia.—Bids are asked until 2:30 p. m., Nov. 18, for constructing a ditch and drain in dist. No. 79, Washington twp. J. L. Hanrahan, co. audt.

Cleveland, O.—Bids are asked until 12 m., Nov. 3, for constructing a drainage sewer around the city hall site. Edward A. Roberts, clk. City Hall Com.

St. Paul, Minn.—Bids are asked until 2 p. m., Nov. 3, for constructing sewers in Dayton ave., Bradley, Geranium, Conway and other streets. R. L. Gorman, clk. B. P. W.

CONTRACTS AWARDED.

Harrisburg, Pa.—Charles Fisher was awarded a contract for constructing the Park st. sewer, for $6,960.

Frankfort, S. D.—Jones & Roderick, of Sioux Falls, secured a contract for sewer work here for $8,915.

Grand Island, Neb.—H. J. Cathroe, of Omaha, was awarded a contract for constructing sewers, for $12,100.

Eagle Grove, Ia.—The contract for sewer construction was awarded to C. Anderson & Co., of Vincent, for $10,290.

Oakland, Cal.—J. F. Greanel was awarded a contract for constructing a sewer in Market and 7th sts., for $5,550.

Pasadena, Cal.—U. R. Nichcevitch, 2824 7th ave., Los Angeles, was awarded a contract for building a sewer in Newton ave., for $5,283.

Oberlin, O.—Buckingham, Clary & Zeigler, of Monroeville, O., secured the contract for constructing a sewer in Hollywood st.

Chattanooga, Tenn.—The contract for constructing a storm sewer in McCallie ave. was awarded to I. H. Mishler, for $4,013.

Rockford, Ill.—G. Maffioli was awarded a contract for constructing a sewer in Central ave., Peach and Independence aves.

Salida, Col.—The contract for building a main sewer in Scott st. was awarded to Peter O'Brien, of Denver, Col., for $53,-075.

Hampton, Ia.—The contract for constructing a sewage disposal plant was awarded to J. T. McCormick, of Ft. Dodge, Ia.

Plainfield, N. J.—James A. Christie was awarded a contract for the extension of the sanitary sewer system in the west end of this city.

Fargo, N. D.—L. W. Schruth was awarded contracts for constructing sewers, as follows: Fifth ave., s., $1.28 a

lin. ft., $59 for manholes, $50 for catch-basins, and $1.50 for combined manhole and flush-hole; 12th ave., N., $1.50, $65, $59 and $156 respectively; 14th st., $1.40, $60, $59 and $126 respectively.

Camden, N. J.—The Central Construction Co. was awarded a contract for constructing a storm sewer in Estaugh ave. and W. Main st.

Evansville, Ind.—Ben Newman Co. secured the contract for constructing a sewer in 6th st.

Long Prairie, Min.—The contract for sewer work was awarded to Bosworth Bros., of Ada, Minn., for $3,390.

Oakland, Cal.—J. F. Greaney was awarded the contract for building a storm sewer in Market and 7th sts., for $5,551.

New Westminister, B. C.—The contract for constructing the 8th st. sewer was awarded to T. F. Sinclaire, of Revelstoke, for $65,995.

. Lestershire, N. Y.—The contract for constructing a sewer in Main st. was awarded, Oct. 3, to F. E. Whitemore, of this city, for $3,289.

Ogden, Utah.—The contract for constructing sewers was awarded, Oct. 10, to the Wheelwright Construction Co., of this city, for $4,500.

Hamilton, O.—Wirtz and Trunck secured contract, Oct. 11, for constructing sewers in 8th and 9th sts., for $1,551 and $1,585 respectively.

Richmond, Va.—The contract for constructing the main trunk of the big Clay ward sewer was awarded to Stamper, Ragland & Co., Oct. 19, for $80,489.

Boston, Mass.—The contract for constructing sewers in Marten, Leslie and Wildwood sts. was awarded to Luke D. Mullen, 161 Devonshire st., for $5,168.

Chickasha, Okla.—The contract for constructing sanitary sewer extensions was awarded to the Hamilton Bros. Construction Co., of Chicago.

Bloomfield, N. J.—The contract for constructing reinforced concrete pipe sewers was awarded, Oct. 18, to John Boylan, of Belleville, for $12,231.50.

Dayton, O.—Shafer & Dill have been awarded contracts for constructing sanitary sewers, as follows: Districts Nos. 4 and 5, $7,571; District No. 6, $2,122.

Marble, Minn.—E. Boulett, of Virginia, has been awarded the contract for sewage and water mains. The Oliver Mining Co. is to supply water to the city limits.

Youngstown, O.—W. E. Gartland, of this city, was awarded contracts for sewer construction, as follows: Loga ave., $15,529; Rayen ave., $3,943.

Flint, Mich.—Thomas Bergen was awarded the contract, Oct. 17, for constructing sewers, as follows: Avenue A and Word st., $1,685.30; Stevens st., $393.60.

Delaware, O.—The Sherman-Riggs Co., engrs., of Toledo, O., have been awarded the contract for preparing plans and specifications for the new sewage disposal plant to be built by the city.

Ft. Crockett (Galveston), Tex.—The contract for constructing a sanitary sewer and sewage pumping plant here was awarded to Kelso & Vantrin, of Galveston, for $16,950.

Grass Valley, Cal.—Jas. Steed was awarded the contract for the extension of the sewer system in Carpenter st. at 18 cents a foot. The Alpha Hardware & Supply Co. secured the contract for furnishing the material.

Galveston, Tex.—The contract for extending the 33rd st. sewer from Avenue P ½ and Q to the government reservation, at 39th st. and Avenue U was awarded to A. C. Falligant, for $6,555.

El Paso, Tex.—Contracts for constructing sewer and garbage disposal plants have been awarded, as follows: Sections 1 and 3, Sorrenson & Morgan, $28,980 and $31,344; section 2, W. R. Anderson, $36,000

Norristown, Pa.—The contract for constructing an 8 in. sanitary sewer in Pine st. was awarded to R. John Phipps, of this city, as follows: $1.59 a lin. ft. for main sewer; $1.53 a lin. ft.; $125 each for flush tanks.

Guthrie, Okla.—A contract has been awarded W. F. Powers at $9,005, for the construction of the East Side sewer. The bid of Smith & White, which was $80 lower, was rejected as unsatisfactory. E. B. Hocker, cy. engr.

West Allis, Wis.—L. W. Schruth, of Fargo, N. D., has been awarded contracts for constructing 24,480 ft. of pipe sewers, as follows: 8-in. sewer, per lin. ft., $1; 10-in., $1.25; 12-in. $1.38; 15-in., double strength, $1.58; 18-in., double strength, $2.30, and 6-in. pipe, 40c.

WATER WORKS.

CONTEMPLATED WORK.

Baton Rouge, Ia.—A $6,000 extension of the water system is planned.

Lynn, Mass.—Plans have been completed for constructing a filtration plant.

New Carlisle, O.—Voted to issue bonds for installing a water works system.

Onaga, Kas.—Voted to issue $18,000 bonds for constructing a water works system.

Aransas Pass., Tex.—A municipal waterworks to cost $25,000 is planned.

Adair, Ia.—Voted to issue $20,000 bonds for constructing a waterworks system.

Lockport, La.—A water system is under consideration and plans are being made.

Libby, Mont.—About $100,000 is to be expended for water works and street lighting.

Spokane, Wash.—Plans have been completed for laying 31 miles of 4 to 14-in. water mains.

Corning, Cal.—Voted to issue $70,000 bonds for constructing water works and sewerage systems.

Madison, Minn.—A water works system is contemplated.

Benton, Pa.—A municipal water works system is contemplated.

Winsted, Conn.—A municipal water works system is contemplated.

Slayton, Minn.—The extension of the water works system is contemplated.

Yerington, Nev.—The council has decided to erect a tank 100 ft. high, with capacity of 100,000 gallons.

Denison, Tex.—This city voted to issue $50,000 bonds for enlarging and improving the water works system.

Chisholm, Minn.—About $80,000 has been appropriated for the extension of water service, filtration plants, etc.

Sallisaw, Okla.—Voted to issue $16,000 bonds for constructing water works and electric light plant extensions.

Wooster, O.—A resolution has been passed providing for the issue of $35,000 bonds for installing a new water supply system.

Oklahoma City, Okla.—Will vote, Nov. 8, on the issue of $350,000 bonds for the improvement of the water department.

Homer, Mich.—This city voted to issue $20,000 bonds for providing a pumping station.

West Carrolton, O.—Plans are being prepared for improving and enlarging the

water works system, including a new pumping station and concrete reservoir.

Winnipeg, Man.—The question of constructing a new water supply will be voted on.

Newton, Ia.—Council is considering the question of constructing a new stand pipe.

Minot, N. D.—This city will erect a dam for the purpose of conserving the water supply.

Kingston, Ill.—This town voted to issue $4,000 bonds for constructing a new water works system.

Collbran, Col.—Voted to issue $9,000 bonds for constructing a municipal water works system.

Clay Center, Kas.—A resolution has been adopted to construct a 2-in. water main in Lincoln st.

Helena, Mont.—This city will vote Jan. 29 on the advisability of issuing $650,000 water bonds.

Clinton, Ill—A new electric pumping plant for the water works system is contemplated by the city.

Galesburg, Ill.—This city will vote Nov. 8 on the issue of $75,000 bonds for water works improvements.

Martinez, Cal.—An electric or gasoline-driven water works system is contemplated. E. C. Brown, engr.

Birmingham, Ala.—The improvement of the water and light plants is contemplated at a cost of $30,575.

Anna, Ill.—Plans for a water works system are being prepared by C. W. Brown, of Jacksonville, Ill.

Eldorado, Okla.—The citizens have voted in favor of the construction of a municipal water plant. Bids will be advertised for.

Dawson, Tex.—The city has voted to issue bonds to the mount of $8,000 for the erection of a complete water supply system.

Athens, Tenn.—Walter G. Kirkpatrick, of Jackson, Miss., will report on a proposed water works system for the Ingleside Water Co.

Medway, Mass.—Voted to issue $95,000 bonds for constructing a water works system. Robt. C. Donnell, secy. water comr.

Salt Lake City, Utah.—The city proposes to extend the water mains on the northeast bench about 3,700 ft. Estimated cost $15,000.

Portsmouth, O.—Will vote Nov. 8 on the issue of $300,000 bonds for constructing a water works system. W. N. Gobleman, cy. audt.

Kirkwood (Atlanta P. O.), Ga.—This city voted to issue $60,000 bonds for drilling an artesian well, and laying water and sewer mains.

South Forks, Pa.—Plans for installing a mechanical filter plant will be made for the South Fork Water Co. by Chester & Fleming, of Pittsburg.

Coshocton, O.—Resolutions have been adopted for improving the water works system by installing a hydraulic pump and making other improvements.

Lubbock, Tex.—The city is considering the construction of water works and a sewer system. Estimated cost, $80,000. E. L. Dalton, engr., Dallas.

Minneapolis, Minn.—The capacity of the new filter plant is to be increased from 33,000,000 to 39,000,000 gallons. Two electric centrifugal pumps will be needed.

Monroe, La.—The construction of 2 additional concrete water reservoirs to be used as settling basins, and a new system of standard c. i. water mains, is contemplated.

Texarkana, Ark.—Extensive improvements to the water works system is contemplated by the Texarkana Water Corporation, including new mains, standpipe, etc.

Helena, Mont.—Plans and specifications have been adopted for constructing a municipal water works plant. The question will be voted on in January. Mayor Edwards.

Tower, Minn.—A consulting engineer will be engaged to estimate the cost of installing an adequate water works system.

Ft. Worth, Tex.—An extension of the water works system is urged, and an advisory board is planned for the purpose.

Ballinger, Tex.—This city voted to issue $16,000 bonds for extending and otherwise improving the water works system.

St. Paul, Minn.—The Municipal Research Commission has engaged D. H. Maury, of Peoria, Ill., to make investigations and surveys for the city water supply.

Birmingham, Ala.—This city will engage an expert to make an investigation of the water plant in North Birmingham and report on the improvements needed.

Long Beach, Cal.—The water works commissioner recommends the installation of a pumping plant, using electricity or gasoline for power. Plans have been approved for such a system.

Austin, Tex.—The purchase of another turbine engine, at a cost of $14,000, as a reserve and auxiliary, is recommended by Councilman Bartholomew.

Lewistown, Mont.—The question of issuing bonds for replacing the wooden water mains with iron pipe and rebuilding the entire system will be voted on in November.

New York City.—Plans for increasing the water supply of Queensboro by the extension of the city's service are being discussed. Henry S. Thompson, comr. dept. water sup.

Flint, Mich.—The special investigating commission is in favor of constructing a water filtration plant at a cost of $400,000. An additional pump will also be needed. Mayor Selby.

Dallas, Tex.—The Board of City Commissioners decided, Oct. 18, to sink 5 additional artesian wells to augment the water supply. The wells will be sunk in the vicinity of Turtle Creek pumping station and Bachman's reservoir, by Driller R. H. Dearing.

CONTRACTS TO BE LET.

Boaz, Ala.—Until about March 1 for constructing a water works system, steel tank and trestle.

Brookline, Mass.—Until Nov. 3 for furnishing and installing a pumping engine. F. F. Forbes, superintendent water.

Triumph, Minn.—Bids are asked until 8 p. m. Nov. 1 for constructing a 4 in. tubular well. L. O. A. Stockwell, vil. rcdr.

Owensboro, Ky.—Bids are asked until Nov. 1 for constructing a water softening plant, with concrete settling basin. S. Lambert, mayor.

Chicago, Ill.—Bids are asked until Nov. 2 for constructing water service pipes in several streets. Albert F. Keeney, prest. bd. local impvts.

Appleton, Minn.—Bids are asked until 8 p. m., Nov. 7, for constructing a pumping plant for a 15-in. well 185 ft. deep. Manford Horn, cy. recdr.

Boise, Idaho—Until Dec. 1 for furnishing 234 lateral headgates for the Boise Project. U. S. Reclamation Service, Shaw Bldg., Boise.

Chanute, Kas.—Until 5 p. m., Nov. 7, for installing 3 30-h. p. boilers, and laying

9 miles 4 and 10-in. water mains. W. F. Sams, cy. clk.

Fort Crook, Neb.—Until 11 a. m., Nov. 4, Lieut. A. W. Lane, constructing quartermaster, constructions of reservoir and well, 10 per cent. check.

McLeansboro, Ill.—Until Nov. 3 for constructing a reservoir and filter, and the extension of the water mains. John R. Cross, mayor; O. M. Rice, cy. clk.

Binghamton, N. Y.—Bids are asked until 1 p. m., Nov. 1, for constructing a 5,000,000 gal. distribution reservoir. John D. Davidson, secy. bd. water comrs.

New York City.—Bids are asked until Nov. 2 for furnishing c. i. pipe, special castings, and valve box casting in all the borough. Henry S. Thompson, comr. water sup., gas and electricity.

Portland, Ore.—Bids are asked until Nov. 30 for constructing the Lost River diversion channel, about 7 miles southeast of Klamath Falls, Ore., Klamath Project, California-Oregon. Frank Pierce, acting secy.

Klamath Falls, Ore.—Until 2 p. m., Dec. 15, for constructing the Lost River diversion works, located 6 to 10 miles southeast of here, requiring concrete diversion dam, culverts, bridges, etc. U. S. Reclamation Service, Washington, D. C., Portland or Klamath Falls.

New York City.—Until 2 p. m., Nov. 2, for constructing water mains and appurtenances in various sts. in Borough Park, Lepperts Park, Mapleton and Coney Island districts, Boro of Brooklyn; furnishing and delivering cast iron pipe, special castings, and valve-box castings. Henry S. Thompson, comr. of water sups., etc.

San Augustine, Tex.—This city voted to issue bonds for installing a water works system.

Munday, Tex.—This city voted to issue $10,000 for constructing a water works system.

Hearne, Tex.—The question of installing a water works system may be voted on in the near future.

Yazoo City, Miss.—Bids are asked until Nov. 9 for boring an artesian well. S. S. Guffin, clk. co. supvrs.

Mt. Airy, O.—This village has under consideration an issue of $12,500 bonds for constructing a water works system.

Georgetown, Tex.—This city is considering the question of issuing $45,000 bonds for the purchase of the water and light plant.

Ada, Okla.—The city council will call an election to vote on the issue of $100,000 bonds for constructing a water works system.

Ft. Oglethorpe, Ga.—Bids are asked until Nov. 15 for constructing a sterilizing plant at this post. Capt. G. Widener, constr. Q. M.

Manitou, Okla.—Bids are asked until 2 p. m., Nov. 3, for constructing 3,700 ft. 6-in. and 8,400 ft. 4-in. c. i. pipe, 10,000 ft. 6-in. wood pipe, hydrants, valves, standpipes, etc. J. M. George, cy. clk.

CONTRACTS AWARDED.

Eveleth, Minn.—The Fayal road water main extension was awarded to the Pastoret-Lawrence Co. of Duluth.

Hastings, Minn.—A. H. Truax, of Hastings, has the contract for sewer and water works construction, $20,199.

Orrville, O.—Eshelman & Bechtal Co., city, have the contract for laying about 9,482 ft. 4 to 10-in. pipe, $7,94[illegible].

Heavener, Okla.—L. Y. McFarland, of Bartlesville, was awarded the contract for a $50,000 water works system.

Chisholm, Minn.—Joseph Cummings was awarded a contract for erecting piers under the new settling basins for $3,118.

Bowbells, N. D.—George W. Kemper, of this city, has been awarded a contract for constructing the water works system.

Audubon, Ia.—The Des Moines Bridge & Iron Co., of Des Moines, has been awarded a contract for a new stand pipe, for $2,478.

Harrisburg, Pa.—The contract for constructing a 1,000,000 gal. concrete reservoir was awarded to W. S. Miller, Telegraph Bldg., for $17,705.

Underwood, Ia.—The contract for constructing a water works system was awarded to the Des Moines Bridge & Iron Works, of Des Moines, for $7,000.

Salt Lake City, Utah.—P. J. Moran was awarded a contract, Oct. 10, for water main extension in City Creek Canyon, for $119,739.

Limon, Col.—The contract for constructing a water works system was awarded to Marshall Bros., of Las Animas, Col., for about $21,000.

Valley City, N. D.—The contract for constructing 2,541 feet of water mains was awarded to the Valley Cty Plumbing & Heating Co., for $2,875.

Austin, Minn.—The J. W. Turner Improvement Co., of Des Moines, Ia., was awarded the contract for constructing a gravity water system for $38,885.

Kansas City, Mo.—The contract for constructing a new water intake at the Quindaro Station was awarded to the Union Bridge Co., Oct. 12, for $63,000.

Milford, Neb.—The contract for constructing a water works system was awarded to the Inter-Mountain Bridge & Construction Co., of Tecumseh, Neb., Oct. 10.

Cloquet, Minn.—The Pastoret-Lawrence Co., of Duluth, have the contract for 7,000 ft. 6-in. s. i. pipe; 7,000 ft. 8-in. sewer pipe; 18 manholes; and construction; $16,500.

Jacksonville, Fla.—The Logan Concrete & Engineering Co., of this city, was awarded the contract for constructing a covered reinforced concrete reservoir, Oct. 4, for $57,500.

Belle Fourche, S. D.—The contract for constructing a water works system was awarded to the Western Engineering Co., of Yankton, S. D., for $50,000.

Broken Arrow, Okla.—The contract for constructing a water works system was awarded to the Southwestern Construction Co., of Oklahoma City.

Provo, Utah.—The contract for constructing the aqueduct and supply mains was awarded to the James Kennedy Construction Co., of Salt Lake City, for $51,845 and $64,359 respectively.

Marble, Minn.—The contract for constructing a water works and sewer system, bids opened on Sept. 12, has been awarded to H. V. Bartlett Co., Virginia, Minn., at $24,500.

Waterloo, Wis.—The contract for constructing 18,000 feet, 4, 6, 8 and 10-in. mains, setting 5 hydrants, valves and valve boxes, was awarded to F. E. Kaminski, of Watertown, for $7,554.

North Platte, Wyo.—The contract for furnishing c. i. pipe for the Pathfinder reservoir, North Platte Irrigation Project, was awarded to the Charles F. Elmes Engineering Works, 50 Morgan st., Chicago, for $6,500.

St. Paul, Minn.—Charles Kampfer & Sons, of this city, was awarded the contract for constructing a brick pumping station at Centerville Lake and Robinson Cary and Sands, the contract for installing equipment, for $14,800.

Kansas City, Mo.—The contract for constructing 8,000 ft. of revetment on east side of Missouri river, to prevent wa-

ter from flowing away from the water intake at Quindaro, was awarded to Farney & Baker, of this city, for $90,085.

Alva, Ore.—Lund, Keenan & McCarthy, of Blackwell, Okla., secured the contract, Oct. 4, for water works extensions, for $5,634. The Chicago Bridge & Iron Works, of Chicago, was awarded a contract, Oct. 6, for constructing a steel reservoir.

Moline, Ill.—The contract for constructing water mains and sewers in the residence portions of this city have been awarded to C. A. Berglund, for $1,287.30 and $798.50 respectively.

Pella, La.—Joseph E. Bortenlanger, of Omaha, Neb., has been awarded five of the eleven contracts by the city council of Pella, La., for the work and material for the town's new $80,000 water and lighting systems. Mr. Bortenlanger's contract amounts to $42,644.

BRIDGES.

Lawrence, Mass.—Masonry work for bridge in Billerica st., to Coughlin & Shells, $2,285.

Muskogee, Okla.—County is considering election on $200,000 bonds for erection of bridges.

Jacksonville, Fla.—To Horn & Neff, Slatington, for constructing bridge over Ontetaunee creek.

Peoria, Ill.—Plans were approved Oct. 20, for the proposed new steel bridge.

Bristol, Pa.—Bucks county comrs. will erect concrete span bridge over Adams Hollow creek.

Merced, Cal.—Plans have been prepared for constructing 5 concrete bridges. C. D. Martin, cy. engr.

Omaha, Neb.—The construction of a viaduct for 30th street in the Sheely district, is contemplated by the city council.

Boston, Mass.—The committee on highways voted to recommend the new steel bridge at Bemis st.

Greenfield, Ind.—Bids are asked until Nov. 7 for constructing 3 bridges. C. H. Troy, co. audt.

Vincennes, Ind.—Bids are asked until Nov. 9 for repairing 7 steel bridges. John Scott, co. audt.

Crown Point, Ind.—Bids are asked until Nov. 7 for construction or repair of 4 bridges. Chas. A. Johnson, co. audt.

Missoula, Mont.—City Engr. Fred Buck is designing bridge which city proposes to build across Rattlesnake creek, near its mouth.

Noblesville, Ind.—The contract for erecting a bridge over Fall creek was awarded to John W. Ascott, of Anderson, for $8.484.

Steubenville, O.—City Engr. Leech has submitted two sets of plans to the board of control for a bridge to span Lincoln creek.

Cincinnati, O.—Bids are asked until Nov. 11 for constructing a concrete bridge on Fallis road. Fred Dreihs, clk. co. comrs.

St. Paul, Minn.—City Engr. Rundlett has prepared plans for a cement bridge over E. 7th and Earl sts., to cost about $35,000.

Montmagny, Que.—Bids are asked until Dec. 1 for constructing an iron bridge over the Riviere du Sud. A. Renaud, secy.-treas.

Albany, N. Y.—State Engr. and Srvyr. Williams approved plans, Oct. 15, for erecting a concrete bridge on the Burdick road.

Brady, Tex.—Two bridges will be built across the Colorado, one at Waldrip and one at Stacy, and one across the San Saba at Voca and one in the town of Brady across Brady creek. The four bridges will call for an aggregate expenditure of $42,000.

Mays Landing, N. J.—County has sold $60,000 bonds to rebuild 3 large bridges across meadows from Pleasantville to Atlantic City.

Polk, Neb.—The commissioners of Polk and Merrick counties have decided to build a bridge across the Platte river north of here, at Little's Island.

Norwich, Conn.—The contract for constructing a new bridge across Four-Mile river has been awarded to Morton F. Plant, of New London.

Indianapolis, Ind.—Bids are asked until Nov. 11 for constructing a bridge over Fall creek in Washington township. Albert Sahm, co. audt.

Norristown, Pa.—The contract for constructing a 3-arch stone bridge over Perkiomen creek was awarded, Oct. 10, to the Toledo & Massillon Bridge Co.

Dallas, Tex.—The contract for erecting the Dallas-Oak Cliff viaduct was awarded, Oct. 10, to Corringan, Lee & Halpin, of Kansas City, Mo., for $44,500.

Tunica, Miss.—Tunica Co. Comrs. have authorized $50,000 bond issue for construction of bridges and roads. E. P. Mangum, president bd. of supvrs.

Richmond, Va.—Council has appropriated $2,000 for competitive designs for construction of a new structure to replace the present Mayo's bridge; cost $250,000.

Texarkana, Ark.—Austin Bros., of Dallas, Tex., were awarded the construction of a steel bridge at McKinney's bayou, $2,200. The Day creek bridge was let to W. A. McColm, city, $515.

Spokane, Wash.—The cy. engr. has been directed to prepare a rough sketch and estimates of the cost of building a concrete bridge on Hangman creek.

San Diego, Cal.—Bids are asked until 2 p. m., Nov. 10, for constructing a bridge across the Santa Marguerita river, near Ysidora. Wm. H. Francis, co. clk.

Wheeling, W. Va.—Road and bridge com. of co. engrs. has instructed A. S. Bell, co. road engr., to prepare plans and specifications for rebuilding Bethany pike bridge.

Pueblo, Col.—Bids are asked until Nov. 7 for the removal of the present steel bridge across the Arkansas river at Union ave. and constructing a new steel bridge. D. F. Gaymon, cy. engr.

Ocean City, N. J.—The Cape May County Board of Freeholders has instructed its engineer to prepare plans and specifications for a bridge between Beesleys Point and Somers Point, connecting the counties of Cape May and Atlantic. Estimated cost is $300,000.

Topeka, Kas.—The contract for completing the Melan bridge extension, which was begun last spring by Johnson & Co., of Kansas City, was awarded to James O'Conner & Son, of Kansas City, Mo., Oct. 17, for $33,397.

Bellaire, O.—Bids are asked until Nov. 5 for constructing a suspension foot bridge over McMahon's creek at Georgetown, 1½ miles west of here. Geo. Kern, prest. bd. trustees; John P. Lowman, clk. Pultney twp.

Petersburg, Ind.—Bids are asked until Nov. 9 for constructing 3 steel bridges in Washington, Madison and Jefferson twps. Frank R. Bidderback, co. audt.

St. Louis, Mo.—Plans for the Compton ave. viaduct have been approved by the board of public improvements so far as the general outline and style of the structure is concerned, and it now only remains for the detail plans to be com-

pleted and approved; the viaduct is to be entirely of reinforced concrete, the full width of the street, and is to cost about $370,000, all to be paid by four railroads; there is to be no steel superstructure.

STREET LIGHTING.

Union, Ore.—This city voted to issue bonds to install an electric light plant.

Hannibal, Mo.—The Citizens' Gas Co. is planning $125,000 improvements. J. W. Thompson, prest.

Drexel, Mo.—Plans are being prepared for installing an electric light plant by A. J. Harbison.

Sulphur, Okla.—Congress will be asked to appropriate $122,404 for Platt National Park here.

Aurora, Ill.—A water power scheme involving 3 concrete dams across the Fox river is being considered.

Rockford, Ill.—The city intends to purchase a new engine and dynamo for their power plant, to cost about $4,000.

Osyka, Miss.—Nov. 1, X. A. Kramer, C. E. Magnolia, Miss. Building $20,000 electric light plant and water works.

Parkersburg, W. Va.—Bids will be asked for soon for lighting the streets, on the basis of 1 and 10 year contracts.

Decorah, Ia.—The American Construction Co., of Newton, Ia., has contracted for the building of a gas works in this place.

Paris, Tex.—A combined electric light and water works plant is contemplated by the city council. E. H. McCuistion, mayor.

Almonte, Ont., Can.—The contract for erecting concrete dams on outlets of Lakes Gull and Cross, to A. C. Gilmour and George Bradford, city.

Jacksonville, Fla.—The Schofield Engineering Co. has been awarded the contract for the new electric light plant. Cost about $375,000.

Paintsville, Ky.—The contract for building and equipping an electric light and water plant was awarded to Stuart H. Bowman and H. H. Hughes, of Huntington, W. Va.

Canby, Minn.—Until 8 p. m., Nov. 3, J. J. Dodds, cy. engr. Electric equipment for operating sewage pump; 15-k.w. a. c. generator, switchboard, 75-h.p. motor, etc.

Prince Albert, Sask., Can.—The city has authorized C. H. Mitchell, of Toronto, to prepare plans for a 10,000-h.p. water power development, to cost $1,000,000.

Baldwinville, N. Y.—The general contract for erecting power house here for the Seneca River Power Co. was awarded, Oct. 14, to D. E. Wadsworth, of Fulton.

New York City.—Until Nov. 1, for constructing and installing electric light system in several buildings of the department of street cleaning. Wm. H. Edwards, comr. st. cleaning.

Culiacan (Sinaloa), Mex.—Surveys, estimates, etc., are being made preliminary to establishing a large electric power enterprise on the Pacific coast of Mexico. The Mayo River Power & Land Co., of Denver, Col., is promoting the project.

Beverly, Wash.—Plans have been completed for an auxiliary pumping plant at the lower end of the Strahon power ditch at Priest Rapids.

Montevallo, Ala.—Plans are being considered for installing an electric light and power plant for lighting residences, and power for dairy and farm machinery. Dr. R. A. Berry.

Forest Grove, Ore.—A franchise has been granted A. Welsh, of Portland, to erect and maintain poles and wires along certain streets for the transmission of power and electricity.

Spokane, Wash.—This city is considering plans presented by George W. Armstrong, prest. of the bd. of pub. wks., for a municipal water, light and power plant, which will cost, if the plans are adopted, $400,000.

Casselton, N. D.—W. T. Sprake advises us that he desires someone to put in an electric light plant in this city. A liberal franchise will be granted. About 100 k. w. machinery desired.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Amarillo, Tex.—A garbage crematory is contemplated.

Duluth, Minn.—A levy of $15,000 has been made for the building of an incinerator.

Rochester, N. Y.—Specifications will be prepared for erecting a refuse incinerating plant.

San Francisco, Cal.—Until Nov. 16, bd. of pub. wks., city hall. Two incinerating plants, 120 tons each; cost $250,000.

Superior, Wis.—The board of health will petition, the city council for an appropriation of $15,000 for constructing a garbage incinerator.

Erie, Pa.—The city will erect a $50,000 incinerating plant. Thos. Hanlon, clk., city hall; Benj. E. Briggs, cy. engr.; C. C. Brown, Indianapolis, consulting engr.

Columbus, O.—An ordinance was approved, Oct. 7, by the council finance committee, to appropriate $20,000 for erecting a supplementary plant at the garbage disposal works.

FIRE APPARATUS.

Lake Charles, La.—The city desires to purchase an automobile fire wagon and one hose cart.

Twin Falls, Ida.—This place has voted bonds in the sum of $50,000 for street paving, fire apparatus, etc.

Duluth, Minn.—The bd. of fire comrs. is advertising for a new gasoline fire engine for use at New Duluth.

Washington, D. C.—F. J. Wagner, chief of the fire dept., is advocating the purchase of motor fire apparatus.

Duluth, Minn.—The council authorized the secy. of the bd. of fire comrs. to advertise for a fire engine for New Duluth, to cost about $3,000.

Moline, Ill.—Bids are to be asked soon for the purchase of a combination auto truck. Chief Hawk.

Lake Charles, La.—The purchase of equipment for the new fire station is proposed by the city council.

Freeport, Ill.—The contract for constructing the West Freeport fire station was awarded, Oct. 17, to Garman Bros., for $4,793.85.

Highland Park, N. Y.—Bids are asked until 8 p. m., Nov. 10, for furnishing 300 ft. 2½-in. hose. Jas. R. Earle, clk. boro council.

Escanaba, Mich.—This city will vote, Nov. 8, on the issue of $15,000 bonds for the construction and equipment of the proposed fire station in the 7th ward.

Fremont, Neb.—Bids are asked until Nov. 7, for furnishing the city with a combination hose and chemical power driven fire apparatus, completely equipped with the exception of fire hose. P. A. Nelson, chm. bd. pub. wks.